OCTOBER, 1955

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

IN THIS ISSUE

THE PLYMOUTH QUALIMATIC V-8 ENGINE PLANT

V-8

Editorial: "A heritage from Walter P. Chrysler"

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Developing Good SUPPLIER RELATIONS

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MECHANIZED ASSEMBLY

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SELECTING AND TRAINING Men to Operate New Plant

V-8

AUTOMATIC TESTING

V-8

Coordination of PROCESSING AND DESIGN

Huebner Publications, Inc.

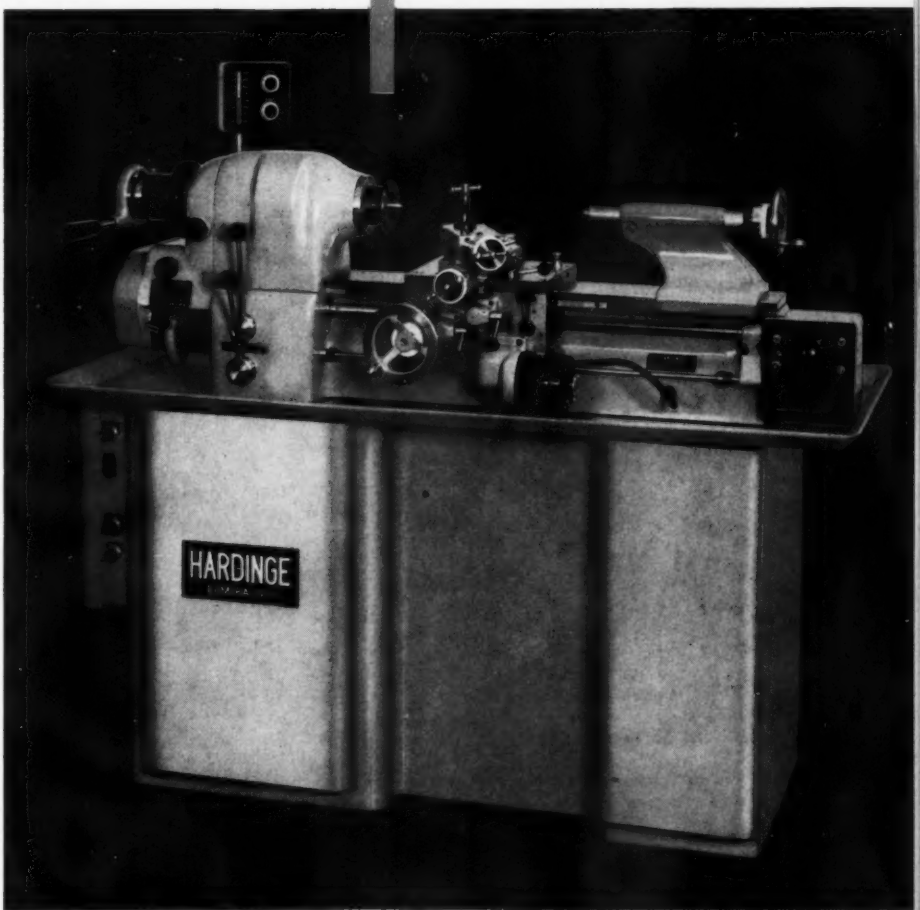
CLEVELAND 13, OHIO

BPA

HARDINGE

ELMIRA, N.Y.

"The OUTSTANDING TOOL ROOM LATHE"



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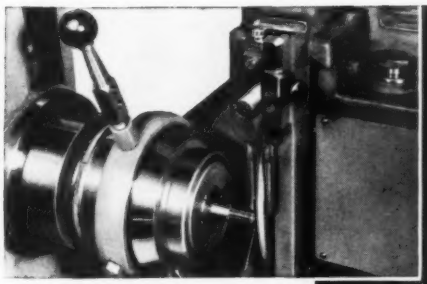

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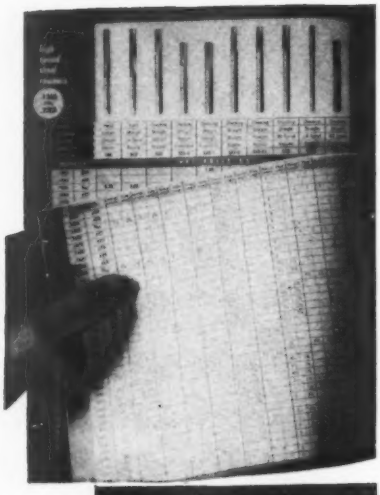

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TOOLING and PRODUCTION

The Magazine of Manufacturing Management

formerly Tool-Die-Machine PROGRESS 1934-1941
TOOL & DIE JOURNAL 1941-1951

George J. Huebner, Founder

VOL. XXI—No. 7 OCTOBER, 1955

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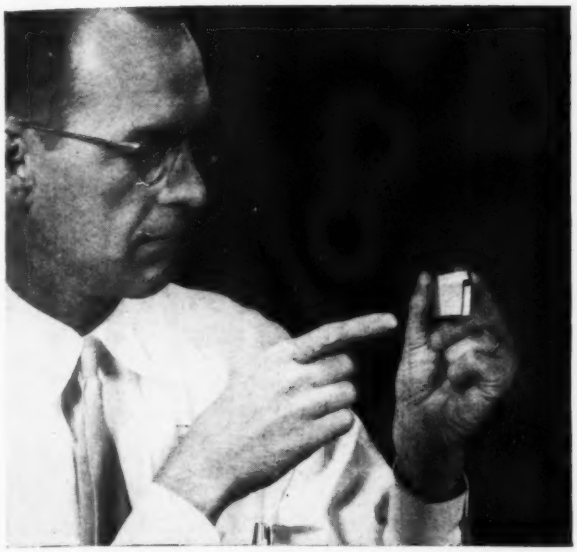
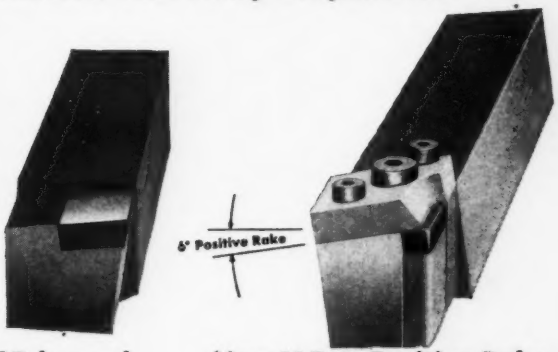


Works Like Positive Rake Brazed Tool . . . Saves Money with "Throw-Away" Inserts, Cast Alloy Chipbreaker Plate



AR brazed tool

New V-R 6° Positive Rake Toolholder

Both will do exactly the same operations!

SAVES MONEY 8 BIG WAYS

- Free cutting action of 6° positive rake ends excessive heat . . . eliminates distortion of piece parts.
- Allows use of harder grades of carbide than are normally used in brazed tools.
- Elimination of excessive heat with positive rake toolholders allows machining to closer tolerances.
- Patented V-R "elevator" locks "Throw-Away" insert solidly in toolholder at 6° positive rake angle . . . firm as a brazed tool.
- Cutting edge automatically positions on center . . . saves setup time.
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- Eliminates all carbide grinding.

Now V-R combines the operating efficiency of a positive rake brazed tool into a 6° positive rake toolholder with the proven economy of "Throw-Away" blanks and a cast alloy chipbreaker.

NOW A TOOLHOLDER FOR MACHINING METALS REQUIRING POSITIVE RAKE

Aluminum, soft brass, copper, bronze, stainless steel and all other types of materials, including alloyed steels can now be machined more easily and economically than ever before.

All the advantages of positive rake design can mean savings in your plant with this new V-R Toolholder. Call your V-R representative or write today for complete information.

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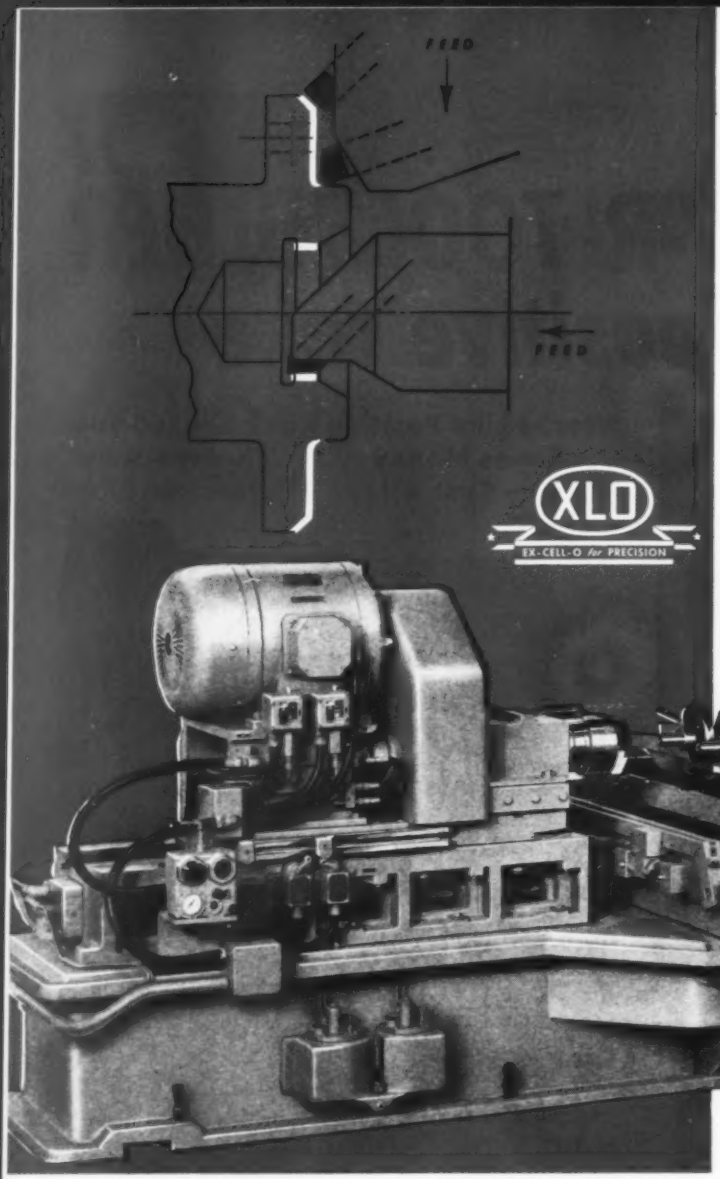

On this Ex-Cell-O special Machine two standard, hydraulically operated slides are mounted on a base with a transfer type fixture between them. The left slide, which supports the spindles, advances, and hydraulically operated chucks grip and rotate the parts. Then the right slide carrying the tools advances. Crankshaft operations include precision boring a diameter within limits of ±.0005", holding the bore concentric with main bearings, facing a surface square with main bearings, and chamfering an edge. Surface cuts are indicated in white in diagram at left.

EX-CELL-O Special Machine Bores, Faces 2 Crankshafts SIMULTANEOUSLY

What an improvement!

Automation equipment picks up *two* automotive crankshafts, places them in machining position, bores, faces and chamfers the flange ends simultaneously, and transfers them to the unloading position *all in one automatic cycle.*

Building special purpose machines is an Ex-Cell-O forte. Manufacturers with problems in accuracy, production, and in combining numerous operations, look to Ex-Cell-O.

In return for this confidence Ex-Cell-O builds them special machines which quickly pay for themselves through substantial production increases, improved quality, and reduced unit costs.

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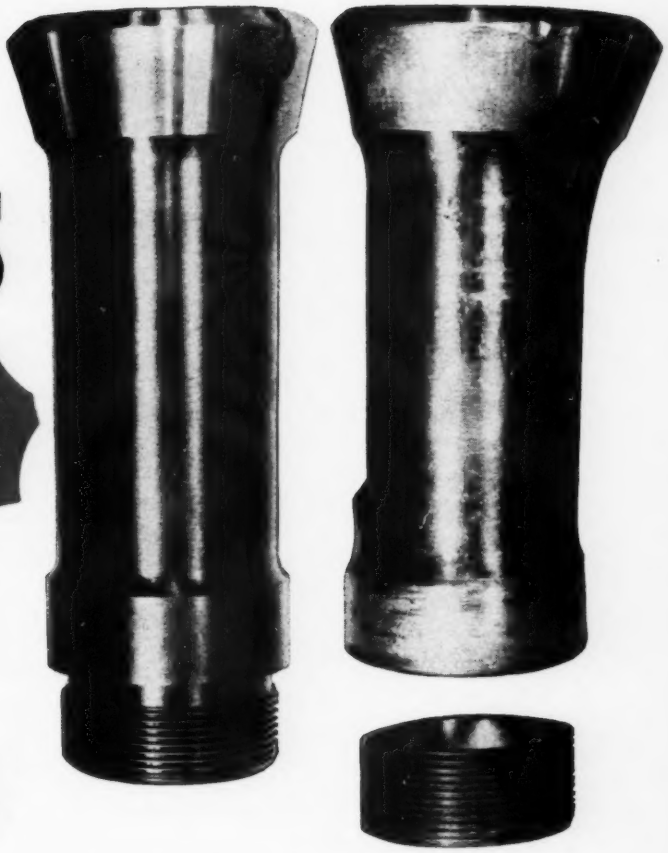
FOR ALL MACHINES

will not break off at the threads or your money back



Due to our unique design and specialized manufacturing process we can guarantee that Benco Collets for all machines will not break off at the threads . . . on a money back or free replacement basis.

Benco Collets are made from high carbon, alloy tool steel; not carburized steel. The threads have a tensile strength of more than 175,000 per square inch. Benco Collets have a guaranteed accuracy of .001 run-out per inch of bar extension from the face of the collet.

With all their extra features and your money-back guarantee, Benco Collets for all machines cost no more than ordinary collets. You can save trouble, time and money by using Benco Collets . . . they assure you maximum satisfaction regardless of the size and type of material you use. You can't lose when you buy Benco Collets for all your machines . . . they won't break off at the threads or you get your money back or a free collet. Specify Benco every time — for quality — for value — for performance.

Above is a 1" collet removed from a 1" machine. Imagine the cost of the wreck this collet caused! These two pieces had to be removed from the machine and a new collet installed with loss of time and production.

The Benco Collet shown at the left, due to special engineering, will not break off at the threads.

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CIRCLE INFORM-A-GRAM KEY NO. 7

Talking About Die Sets

WITH

PHIL MARSILIUS

Vice-President
The Producto Machine Co.

Die Springs: Production Bonus or Bottleneck?—It all depends on how you, the user, select them and use them. Die springs fall into three general classifications according to type of wire used – square, oval and round. The type used in a die is determined in the original design and substitution is not easy once the die has been built, since inside and outside diameters, deflection and pressures vary widely among the three types. Great care, therefore, must be taken in the selection to see that the spring will withstand operating conditions. Should the original choice prove incorrect, re-machining of the die to accommodate a different spring type will prove expensive, to say nothing of the costly downtime involved.

Types of Springs—Square wire springs are usually made from high carbon steel and used where a maximum load rate and a normal travel are required. They are best suited to *short* production runs since the forming operation for them and the square cross-section are more apt to result in failure when used for any great length of time.

Oval wire springs are available in three load ratings—30%, 37% and 50% deflection—and in two types of steel, high carbon and electric furnace chrome-vanadium. They are increasing in popularity because their design tends to eliminate failures resulting from structural strains and weak points. Carbon springs of this type are suitable for most applications and can be run for considerable time before failure. Chrome-vanadium springs, while slightly higher-priced, more or less guarantee performance for at least three times longer than carbon steel springs. When extreme economy is not a factor, best performance and reduced downtime are practically insured by use of chrome-vanadium.

Round wire springs are not generally suitable for die applications because of the difficulty of obtaining proper travel and load ratings for the standard sizes.

Hints on Proper Use—Even the best spring can fail if improperly used. Here are a few hints: 1. Springs should be sufficiently supported in a hole or over a rod or stripper bolt to guide the spring adequately under stress. Lack of support can result in crushing, twisting, binding or surface wear on even the best springs; 2. When altering spring lengths by cutting and grinding, care should be taken to prevent excess heat generation which causes spring to lose its temper; 3. For springs set in holes, squaring the bottom of the hole to give a flat seat is an added safeguard toward longer life; 4. Do not deflect springs beyond the recommended limits for the speed of operation.

To prevent die breakage and reduce downtime, your best protection is proper spring selection. **Adv.**

THIS SPECIAL LATHE PUTS PRECISION INTO YOUR DIE SET AT EVERY TURN

Putting precision into a Producto die set begins on semi-steel sets with the turning of the shank and top and bottom surfaces on Producto-built lathes like the one above. These high-speed production lathes are *100% automatic* in function. A gang of cutting tools, preset for each die set size, automatically turns the shank to diameter and length and faces off the top of each punch holder. Next, a companion lathe a few feet away faces the bottom.

Pieces Finish-Ground

The operator loads and unloads the machine and, after checking the shank against standards, drops the piece onto a conveyor which carries it down to the Blanchard grinders. There the bottom is ground for extra precision. Finally, the piece is checked for parallelism and thickness on highly accurate granite surface plates. Die beds go through a similar procedure. Rejects are rare.

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Long experience in designing and building special machinery enables Producto to construct equipment that *machines precision into its die sets at high speed.* This mass-production technique, which almost eliminates human error, is another reason why you can depend on Producto for consistent accuracy in every die set. For precision die sets fast, call your nearest Producto branch.

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any stamping center in the United States or Canada for distributors stocking PRODUCTO.

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Precision Die Sets

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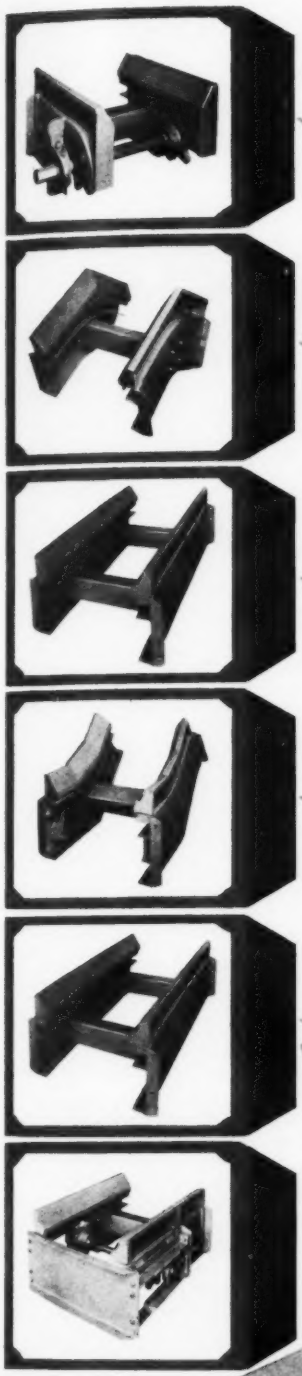
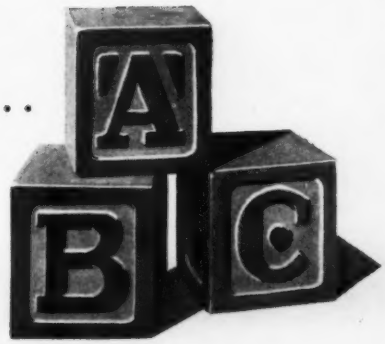


as basic as . . .



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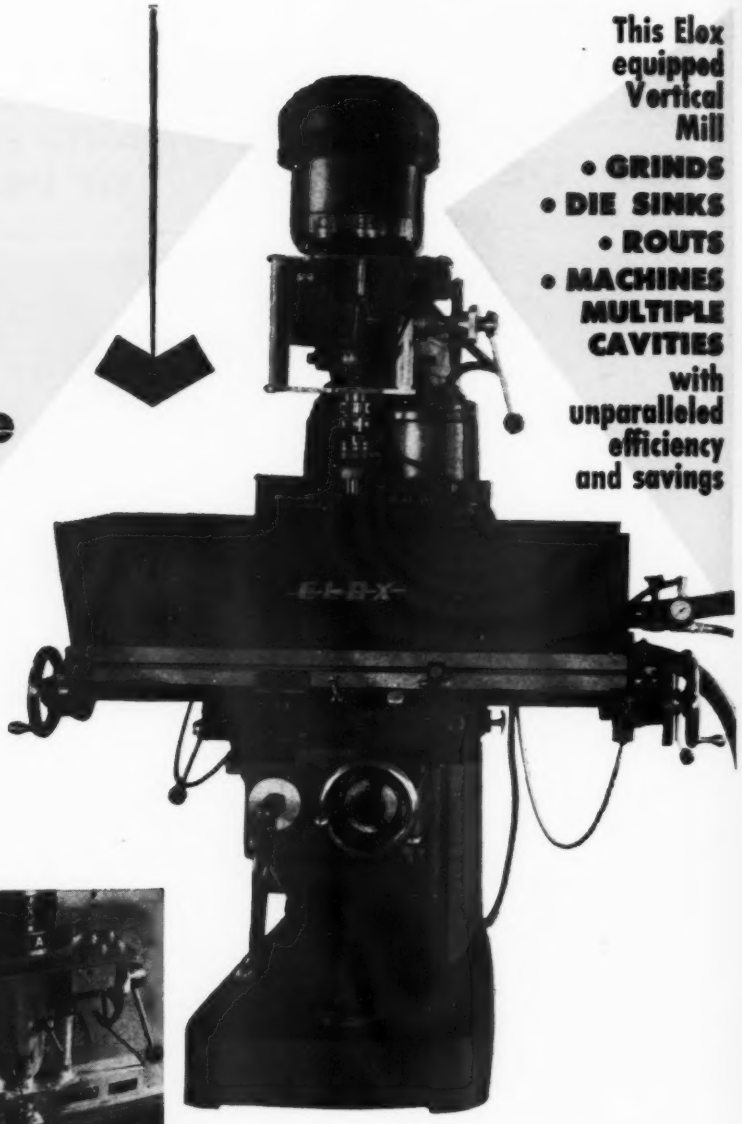
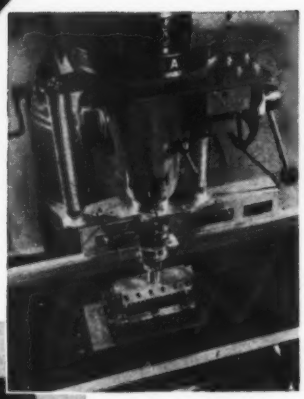
- **DIE SINKS**
- **ROUTS**
- **MACHINES MULTIPLE CAVITIES**

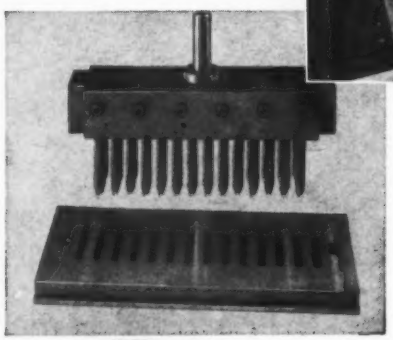
with unparalleled efficiency and savings



conventional machining time 40 hours



Multiple Cavity in coolant retainer tank of Vertical Mill. Machined automatically without operator attention or broach cost.



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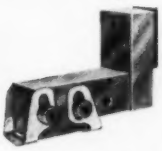
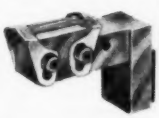
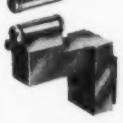
COUNTER-BORE SEGMENTS

HELICAL GEAR SEGMENTS





THREE WIRE THREAD SEGMENTS



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The **ONE** truly **ALL-PURPOSE** Dial Gage

One compact, lightweight, easily handled dial unit and readily interchangeable segments. *Every assembly is as efficient and accurate as though specifically built for each individual application.* Versa-Dial checks internal or external threads for fit, pitch diameter or lead; helical or spur gears for pitch diameter or tooth spacing; grooves, shallow counterbores, narrow shoulders, blind holes, etc. . . . practically all types of internal and external applications. No other dial gage serves so many purposes so well . . . at bench or machine.

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CIRCLE INFORM-A-GRAM KEY NO. 13

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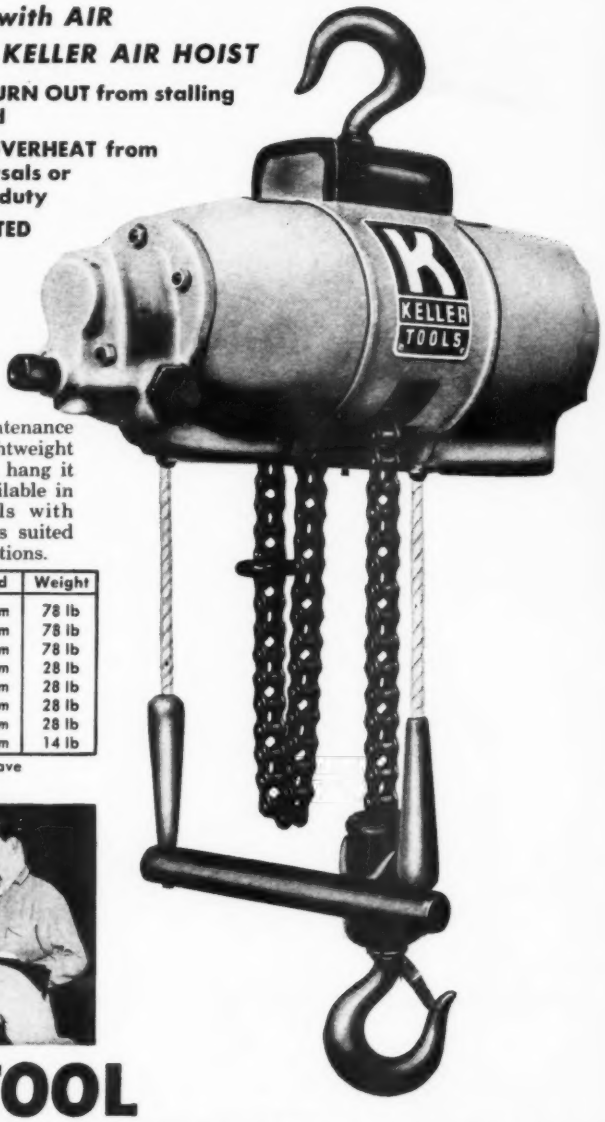
—then Lift with AIR with a KELLER AIR HOIST

- **CANNOT BURN OUT from stalling or overload**
- **CANNOT OVERHEAT from rapid reversals or continuous duty**
- **NOT AFFECTED by dust or fumes**



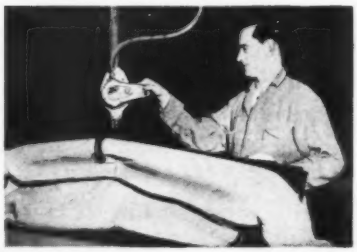
Not only are maintenance costs low, but it is lightweight so that one man can hang it unassisted. Now available in a variety of models with speeds and capacities suited to diversified applications.

Size No.	Capacity	Speed	Weight
86-2V20	2000 lb	19 fpm	78 lb
86-2V20L*	2000 lb	19 fpm	78 lb
86-2V10	1000 lb	35 fpm	78 lb
86-1V10	1000 lb	19 fpm	28 lb
86-1V10L*	1000 lb	19 fpm	28 lb
86-1V5A	500 lb	35 fpm	28 lb
86-1V3	300 lb	80 fpm	28 lb
86A-1 †	150 lb	40 fpm	14 lb

* Link chain hoists—others have roller chains. † Cable hoist.

Versatile New 86A-1 Air Hoist Saves Backaches and Strains

With this new hoist you can handle loads up to 150 lb effortlessly . . . avoid the strains of heavy lifting. Built-in push button control makes it as natural as lifting by hand. Ask for special Catalog 86B.



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KELLER TOOL

DIVISION OF **GARDNER-DENVER**

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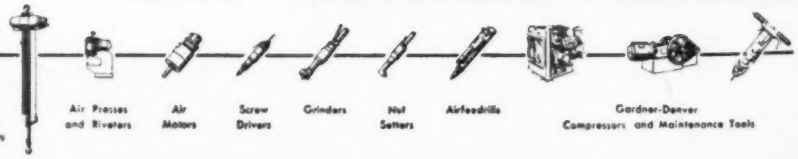

CIRCLE INFORM-A-GRAM KEY NO. 14

AND NOW A NEW PRATT & WHITNEY KELLER

AUTOMATIC TRACER-CONTROLLED MILLING MACHINE

THE BL 3622 MODEL C

WITH THESE IMPORTANT *NEW FEATURES* . . .

- **HEAVIER, MORE RUGGED** . . . to take tough production schedules in stride day after day.
- **MORE POWER (10 hp)** . . . for increased metal removing capacity on today's tough new alloys.
- **BIGGER CAPACITY** . . . to handle larger, heavier workpieces.
- **WIDER RANGE of SPINDLE SPEEDS** . . . with a single, full-range spindle for all speeds . . . 30 to 3600 rpm in 20 steps. Spindle furnished with either No. 12 B&S or No. 50 MM taper bore.
- **POWER DRIVEN CHIP CONVEYOR** . . . no need to stop and shovel chips piled up by fast metal removal.
- **FASTER TRACER RESPONSE** . . . through a new electronic control of machine motions, travel speeds, and feeds.
- **PHENOLIC-TO-METAL BEARING SURFACES** . . . eliminate scoring of ways and preserve original high accuracy.
- **OPTIONAL RAPID TRAVERSE** . . . for vertical and horizontal movements.
- **ONE-SHOT LUBRICATION SYSTEM** . . . insures quick, positive thorough lubrication of all important sliding surfaces.

The NEW BL 3622, Model C is a powerful, horizontal spindle miller that reproduces the shape of any 2-dimensional template or 3-dimensional full model quickly and accurately. Complex or irregular dies, molds, prototypes and other workpieces that cannot be conveniently machined by any other method are handled as easily and economically as simple work. The Keller BL Machine is built ***specifically*** for tracer-controlled milling — not just "adapted". It is rugged, dependable, relatively simple . . . stays on the job year after year.

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Manufacturers of the Layco Tru-Align Die Setup

CIRCLE INFORM-A-GRAM KEY NO. 16

★ ★ ★ ★ ★ ★ ★ ★

Talk of the Month

★ ★ ★ ★ ★ ★ ★ ★

PROGRESS AND POSSIBILITIES IN THE USE OF PLASTICS FOR SPECIAL TOOLING

(Excerpts from a panel discussion held during the technical sessions of the National Tool & Die Manufacturers Association convention in Dayton, Ohio.)

Moderator:

J. A. Mickey
Technical Assistant,
Manufacturing Research Dept.
FORD MOTOR COMPANY
Dearborn, Mich.

Panel Members:

Robert H. Voss
President,
WARREN PLASTICS & ENGINEERING, INC.
Roseville, Mich.

Jack Trimble
Staff Engineer,
Office of the Vice-President in charge of Production
THE BUDD COMPANY
Philadelphia, Pa.

E. Ruddiman
Supervisor
Progressive Die Section
Metal Stamping Division,
Manufacturing Engineering Dept.
FORD MOTOR COMPANY
Dearborn, Mich.

MODERATOR MICKEY: The field of plastics is relatively young. It is about 70 years old. Beginning with the first synthetic or man-made plastics used for billiard balls, progressing through the insulating materials used in the automotive and radio field in the early days, the field

. . . *Continued on page 20*

Jones & Lamson dies are your best buy . . . whether you need Class III or not. They give you extra savings because of our system of "no approximation" . . . a factor that also applies to Class I and II. So, whatever your requirements, Jones & Lamson's *written* Class III or better Guarantee means -----

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Capacities from #4 to 2"

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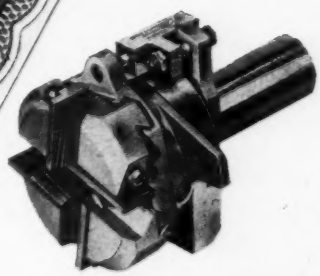
Capacities from
#8 to 4¼"



FOR BROWN & SHARPE AUTOMATICS and SMALL TURRET LATHES
Capacities from #0 to 1¼"

P.S. *J & L die heads also offer: low initial cost, ease of operation, controlled resharpening, use of carbide tipped chasers where applicable.*

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CIRCLE INFORM-A-GRAM KEY NO. 17

MOORE SPECIAL TOOL COMPANY

Holes, Contours, Surfaces

Published in the interests of greater accuracy and quality in the toolroom and on the production line by the Moore Special Tool Co., Inc., 726 Union Ave., Bridgeport 7, Conn., builders of Jig Borers, Jig Grinders, Panto-Crush Wheel Dressers, Precision Rotary Tables, Motorized Centers and a complete line of Hole Location Accessories.

Why you should use the Jig Borer and Jig Grinder to inspect their own work

In more than 90 per cent of all cases, the Moore Jig Borer and Jig Grinder provide the most accurate and efficient means for inspecting their own work. The advantages include:

1. Considerable saving of time results from checking the piece in the original setup, *while still in the machine.* In addition, should an error be discovered—the work is *in position* for correction.

2. The same directness which reduced sources of locational error in comparison to toolmaker error also reduces the number of steps and sources of error in inspection.

3. The machine's measuring system is fully as accurate as *any* standard that might be used in its stead. The inspection values, determined by means of this system, are likely to be *more* accurate than those attained by any other shop standard because reorientation errors are eliminated.

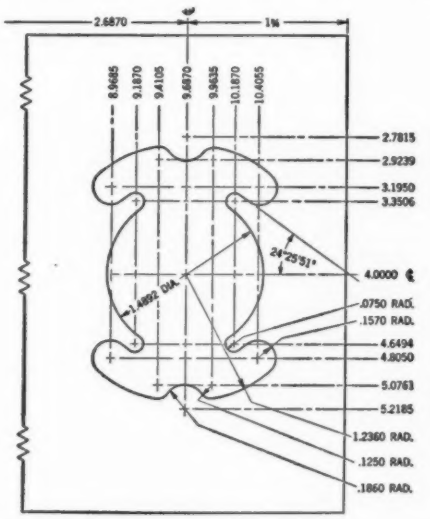
4. The machine spindle provides a rotatable mounting for an indicator. Holes can be picked up directly in this manner, without use of plugs or pins. Out-of-roundness, often mistaken for out-of-location, is easily detected and identified. Full 360° rotation of spindle provides a double indicator reading of any error, thus increasing readability. By vertical movement of the spindle and indicator the shape of the hole can be explored, revealing taper, bellmouth or barrel shape.

5. Contours, one of the most difficult, time-consuming jobs of inspection, can be rapidly and accurately measured and inspected by use of the "indicator measuring" technique. The drawing at the right shows dimensions to be inspected on a complex contour. Of this job it might well be said, "How *else* would you inspect it?"

6. Work jig bored or jig ground to *polar* coordinates on the rotary table can be inspected to *rectangular* coordinates in the same setup. This not only provides a check on possible errors in settings; it eliminates sources of rotary table errors.

7. Paradoxically, the machines will actually inspect somewhat more accurately than they will locate, under most conditions. During inspection, both machine and work are free of vibration, stresses and temperature differentials, so that the accuracy of the measuring system is undiminished.

8. A microscope, interchangeable with the indicator in the machine spindle, can pick up surfaces and small holes which cannot be conveniently reached with an indicator point.



Without modern methods, this contour presents a serious problem to inspect as well as to machine.

Get ALL the answers from this new, 424-page book

The information on this page is just a sample of the valuable, on-the-job aid you can get from Moore's *all-new* book, HOLES, CONTOURS AND SURFACES. Tells you how to produce tools, dies and precision parts *the modern way.* 424 pages, 495 illustrations. 184 pages of Woodworth Coordinate Location Tables from 3 to 100 holes. Price only $5 in U.S.A., $6 elsewhere. Send check or money order to Moore Special Tool Co., Inc., 726 Union Ave., Bridgeport 7, Conn.

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Handles TOUGH STEEL FORGINGS

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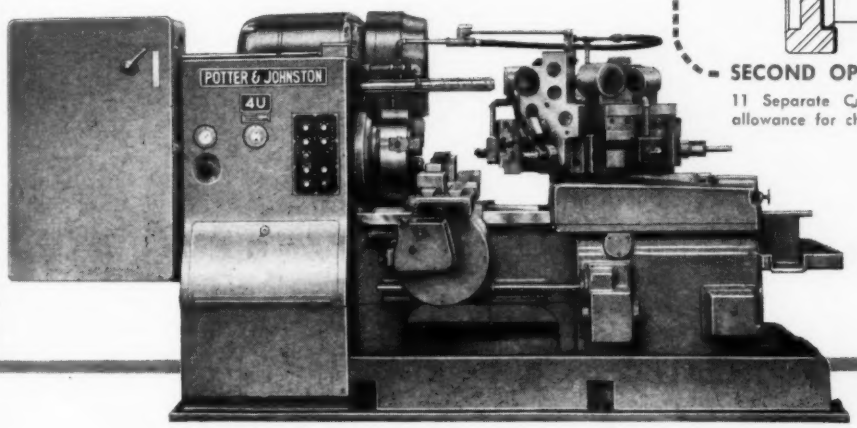
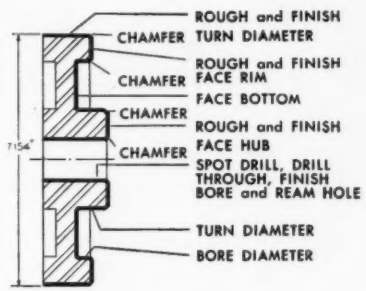
Jobs like machining this change gear blank, forged from 6150 steel, including boring the 1⅛" hole ***from the solid***, are easy, fast, profitable. That's because the P&J 4-U is a ***modern*** machine with the advanced design, added rigidity, and extra speed and power to take today's tough steels in stride.

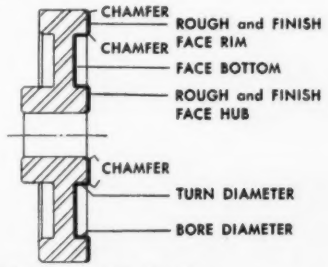
WITH TOOLING ENGINEERED BY P & J EXPERTS





FIRST OPERATION

17 Separate Cuts, 3.41 minutes including allowance for chucking



SECOND OPERATION

11 Separate Cuts, 2.56 minutes including allowance for chucking

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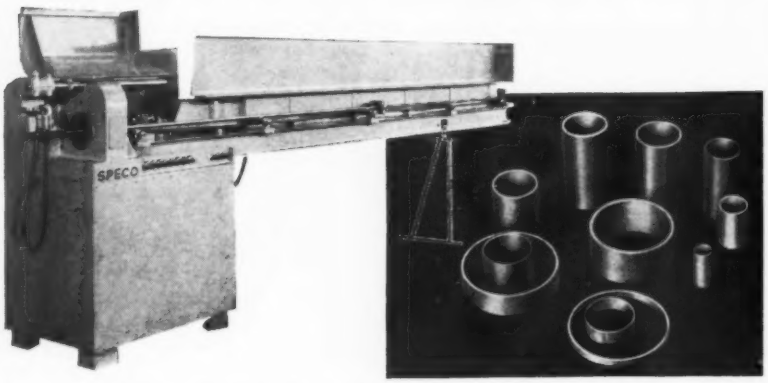
CIRCLE INFORM-A-GRAM KEY NO. 19

You can trim drawn shells like these in a single press stroke!

The Brehm "Shimmy" Die employs a *radically new* trimming principle . . . completely different from ordinary trimming methods. *A cam action inside the die moves the shearing edges four ways*—eliminating slow, costly "horn" and "pinch" trimming operations. You get a perfect edge finish every time . . . and a single die may be used for many different shapes. Production goes up fast. Production costs are slashed! Trims stainless and mild steel, copper, brass, zinc, aluminum, gold, silver, fiber, rubber, plastics. Trims all sizes from fountain pen ferrules to refrigerator doors—in almost any thickness that can be drawn. Brehm Dies can be used in mechanical or hydraulic presses.

The NEW Brehm Trimming Press does *all* trimming in one press stroke . . . takes less power, trims shells up to 16 inches square, 6 inches deep, .125 inch stock—metals, plastics or fibers.

Up to 10,000 pieces in 86 minutes with the new Brehm tube cutter!



The revolutionary Brehm Tube Cutter has a cutting action that makes it the finest machine of its kind ever built! Cuts tubes ⅜" to 2¼" O.D.—with production speeds ranging up to almost 7,000 pieces per hour! With the Brehm shearing action, *there is no loss of stock*—no burred tube ends! Up to 25% more pieces from the same length of stock. Cuts almost any tubing—mild steel, stainless steel, brass, copper, aluminum, etc.

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CIRCLE INFORM-A-GRAM KEY NO. 20

. . . Month's Talk from Page 16

has expanded tremendously. It followed the expansion and progress of the appliance industry, the electronics industry, the automotive, aircraft, and we find plastic applications in our everyday life both visible and invisible. * * * *

Several years ago plastics became well known in industrial applications. These applications have expanded into usages ranging from resin core binders for foundry work to the subject we are interested in today, plastic dies and plastic fixtures.

There are two basic groups of plastic materials. One is the thermoplastic; the other is the thermosetting. Simply expressed, one, the thermoplastic, can be formed and reformed by the application of heat and/or pressure. The other, the thermosetting, goes through a chemical reaction which prevents deformation by heat under normal conditions. It is said it cannot be reused, and in the plastic die fixture field we find the thermosets are the predominant materials. * * * *

Now we come to the phenolics. They are a family of thermosets which have been the work-horse of the industry. These phenolic materials are electrical insulators, and have been used with various fillers.

In recent years, we have developed two other groups of thermosetting materials that are concerned with plastic fixtures and plastic dies. One is polyester. That is a resin which you probably have read a bit about, used with glass fibers for reinforcement. You find its applications range from lamp shades to automotive body parts.

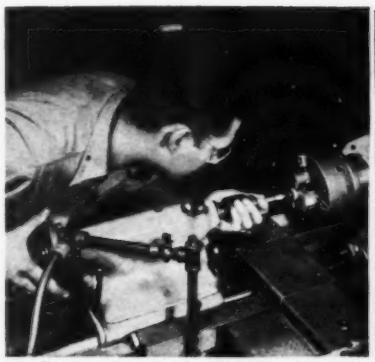
The newest group of resins we refer to as epoxy resins. They are the rich, expensive relatives of the phenolics.

Now the three major thermosets in the tooling industry at this time are phenolics, polyesters and epoxies. Each one has its own advantages and disadvantages. No one plastic is a cure-all.

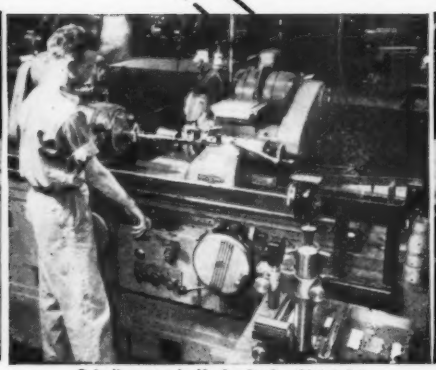
We have had in the last few years the development of glass fiber mats, woven fabrics which have expanded the usage of polyester resins.

. . . *Continued on page 22*

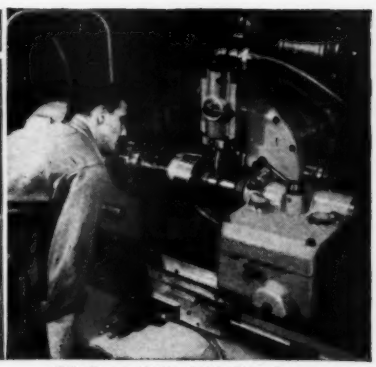
what PIPE MACHINERY CO. integrity means to you



Tapping the i.d. of #00-96NS Thread Ring Gage with .035" tap we machined.



Grinding stand off of a PMCo 4½" A.P.I. Full Hole Rotary Tool Joint Working Plug.



Grinding a PMCo A.P.I. Plug Gage on one of our automatic thread grinders.

Good steel, fine machines, the very best inspection instruments, (all of which we use) are valueless in themselves.

Pipe Machinery has put full value in them for you by adding a priceless ingredient — integrity.

Integrity instilled in the minds and hearts of our group of highly skilled, high principled craftsmen fired with but one purpose: — to produce the best possible gages for you.

The gages they furnish you will save dollars by protecting your product.

Send for our #10 Catalog — or better yet — when you are in Cleveland, stop in and get acquainted.

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PMCO

CIRCLE INFORM-A-GRAM KEY NO. 21

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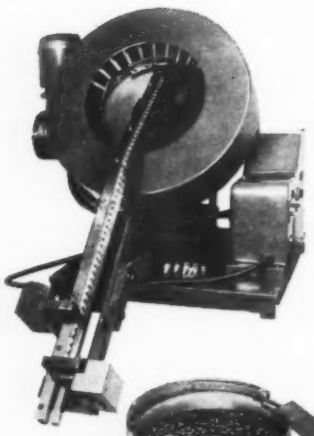

DPS BARREL FEEDER

A Time-Tested Device for use on parts requiring critical selection.

DPS BOWL FEEDER

A VIBRATORY feeding device to effectively select and feed parts that could not normally withstand tumbling.

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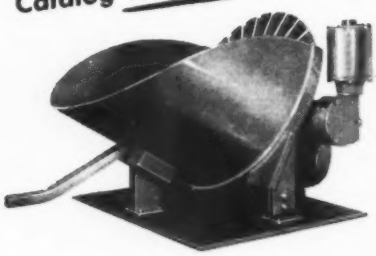

DPS BARREL FEEDER

with STATIONARY RING COVER, operating on Rotary Principle, but providing 3 TIMES THE LOAD CAPACITY of other feeders. Designed for heavy-duty large production runs.

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DETROIT POWER SCREWDRIVER CO.

2827 W. FORT ST. DETROIT 16, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 22

. . . Month's Talk from Page 20

If you take these three basic resins, with about two or three formulations in each group, multiply that times the number of suppliers; multiply that times a large number of fillers ranging from clay, asbestos, mica, to the higher reinforcing types, such as sisal, cotton fabric, glass cloth, you will gain an idea of the complexity and the tremendous number of variations that one can encounter in the plastic field. * * * *

MR. VOSS: I will give you a brief history of plastic dies as I know it. As Mr. Mickey told you, at the present time there are three types of resin we are using in tooling—phenolic, polyester and epoxy. I will describe phenolic and polyester dies to you.

Phenolic is a phenol-formaldehyde resin. This resin is mixed cold with a catalyst that changes it to a solid. There are different types of phenolic—to some you must add your own filler and mix, and others have the fillers added to the catalyst. Phenolic must be heat-cured. If phenolic is not heat-cured, it will constantly keep changing such as an unnormalized steel weldment, as you fellows know. Phenolic must be contained in a steel weldment to make any type of die. It is one of the oldest types of plastics used in tooling.

During World War II, there became such a shortage of critical material that the government requested the aircraft companies to explore the possibility of using plastic for tooling. That is what started phenolic into plastic tooling as we know it today.

A plastic tool shop is quite different from your steel tooling setup as you know it today. The equipment needed is:

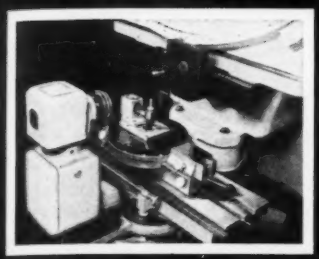
A good plaster shop, woodworking equipment, plastic mixing equipment, spray equipment similar to an automative body repair shop, welding and fabricating equipment, and limited metalworking tools.

In constructing phenolic plastic dies we start very similarly to steel die construction. We take a model or a plaster. On the model we develop our ring lines. When our ring line is okeyed, we take sketches from the build-up

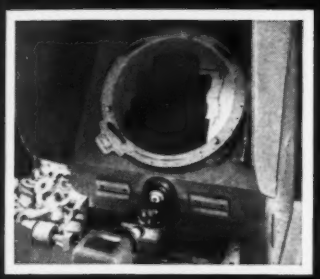
. . . Continued on page 24

JONES & LAMSON OPTICAL COMPARATORS

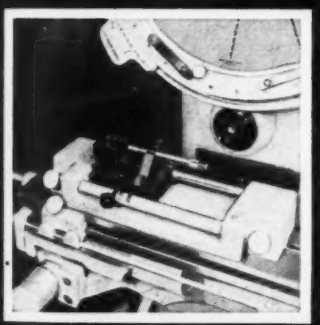
Precise . . . Rapid . . . Flexible . . . Easy-to-operate



A J & L Comparator, with special fixture and chart, easily and perfectly measures a 3-dimensional cam. This is traditionally one of the most difficult of all inspection jobs.



This inexpensive J & L Comparator is precisely measuring four small parts, of different sizes, with the same setup.



Shoulder lengths can be measured to closest tolerance swiftly and accurately with a J & L Comparator. The fixture shown here accommodates a wide variety of parts.

DROODLES

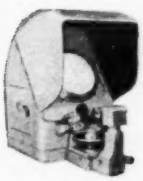
by ROGER PRICE

"DUMB-DUMB BULLET"

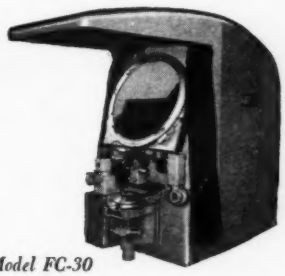
Interesting object, the dum-dum bullet. Invented by Sir Basil Fleemster, the famous explorer and hunter. A kind-hearted man, Sir Basil figured that bullets made of extra-soft lead would prove less distasteful, so to speak, to his prey.

He tested his theory on a hunting trip along the lower Zambesi. After Sir Basil had fired on a herd of antelope, his Number One bearer came running up, crying "Bad gnus, sahib — bullet holes big like soup plates!" Fleemster was so devastated by this pathetic turn of events, and the even more pathetic pun, that he hightailed it forthwith to his farm in Sussex, where he now raises peonies. Ah, well — not the first man to be led astray by softheadedness!

Don't *you* be led astray! Be sure to get all the facts on Jones & Lamson Comparators. These precision-built optical instruments measure and inspect all sorts of objects and parts, ranging in size from the tiniest screw to large turbine blades. J & L Comparators make inspection swift and sure, with accuracy to .0001". Whatever the product or component that you make, if inspection, measurement and quality control are important in your production, it will pay you to investigate J & L Comparators. Send this coupon *today!*



Bench Model BC-14D



Pedestal Model FC-30

Pedestal Model PC-14

JONES & LAMSON

JONES & LAMSON MACHINE COMPANY, Dept. 710, 519 Clinton Street, Springfield, Vermont, U.S.A.

☐ Please send me Comparator Catalog 402-C (describes complete line). I'd like to see a showing of the movie(s)

☐ "What's the Difference" (describes Comparator construction and principles of operation)

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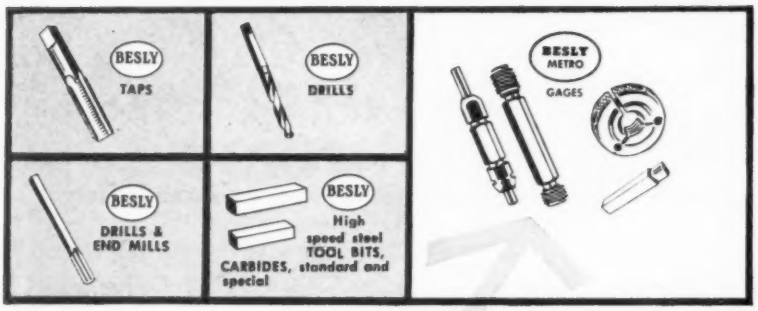

New Additions to the BESLY cutting tool line

BESLY METRO GAGES

BESLY METRO STANDARD and SPECIAL CARBIDE TIPPED TOOLS

Now You Can Get Precision Gages and Carbide Tipped Tools from Besly—and Be Sure of Cost-Cutting Quality

To serve you better, Besly has recently purchased the assets of the Metro Tool and Gage Co. of Chicago, for 15 years a manufacturer with a reputation for outstanding quality, supplying precision gages and carbide tipped tools. This makes the Besly Cutting Tool Line even more complete, enabling you to get a wider selection of Besly *Quality* Cutting Tools that mean longer life and greater accuracy in your shop. A broader Besly selection gives you the advantage of one quality source responsible for all the elements of your machining operations. The net result is *lower final costs* for you as Besly can furnish tools and gages for the whole job, from drilling or turning right through to final gaging. Paper work and purchasing are simplified as you now can buy all your tools from one proven source. See your Besly distributor or write for catalog information.

BESLY

BESLY-WELLES
CORPORATION
Established in 1875 as Chas. H. Besly & Co.
128 Dearborn Avenue
Beloit, Wisconsin

CIRCLE INFORM-A-GRAM KEY NO. 24

. . . Month's Talk from Page 22

and start our design. The design is very similar to hard die construction except we do not consider the patterns. As we know, phenolic must be contained in a metal box. We design this die with a boiler plate shell.

When we are working on the design, we start putting a build-up around the punch opening in the plaster to pour the punch. What we need from the design at that point is strictly the height of our die and height of our punch. We make this build-up and we pour our punch. We put into our punch a steel weldment to bolt the punch to the die shoe, and, if you have wear plates, to bolt the wear plates also, so phenolic will not take a thread.

After this punch is poured it is put into an oven and baked to 190 degrees. This baking varies with the size of the pour, usually around 8 to 12 hours.

After our punch comes out of the oven, we take our previously fabricated steel weldment, we wax up the sides of our punch where there is clearance between our ring and punch. Then we pour our ring. If we are going to do any amount of production, we put cast iron rings on our dies. The plastic, as we know it today, will not stand up under any type of a run without iron rings. The iron ring that we use in any type of production die is about one inch thick, with a slot cast on the T to imbed it in the plastic. We spot our rings loose on the floor and then we mount them on our plaster and pour our plastic around the cast iron ring.

After we have poured our upper ring, that goes in the oven and is baked again from 8 to 12 hours. When that comes out of the oven, we pull it apart, clean it up; then we wax our punch for metal clearance. After the punch is waxed, set it back together.

Then our steel box which has been previously fabricated is surrounding the punch and the ring and we pour our die.

This goes back in the oven and is baked for 8 to 12 hours at 190 degrees. When it comes out of the oven we clean up our die and it goes into the press.

It is very amazing that although we have made some pretty complicated dies and have had to touch up our rings a little bit or touch up our beads to

. . . *Continued on page 29*

The Shaft Shows the Holding Power of ALLENPOINT Set Screws

ALLENPOINT—Smooth, even bearing surface. Deep point penetration for maximum holding power.

SERRATED POINT—Shaft penetration is slight and irregular. Bearing surface is spotty and rough.

Loosen a Set Screw and Look at the Shaft It's Pressing Against.

Has The Set Screw Made A Full Circle Impression?

To obtain the maximum resistance to rotation and sliding movement, a set screw must bear evenly on the shaft. Allenpoint Set Screws reproduce a full circle pattern against their mating surface for increased holding power. Even on shafts of small diameter you get a full circle impression with the smaller cup point of Allenpoint Set Screws.

Has The Point Left An Uneven Ridge Around The Indentation?

The holding power of a set screw will be greatly reduced if the bearing surface is rough and irregular. Serrated point set screws cut into the shaft, raising a chip, removing stock and weakening their grip. Allenpoint Set Screws press firmly into the shaft and form a smooth, deep indentation. The result is holding power that tops any other type point.

WHEN ORDERING THROUGH YOUR LOCAL INDUSTRIAL DISTRIBUTOR, SPECIFY ALLENPOINT SET SCREWS

For additional information contact your Allen Distributor or write to —

ALLEN HEAD

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MANUFACTURING COMPANY

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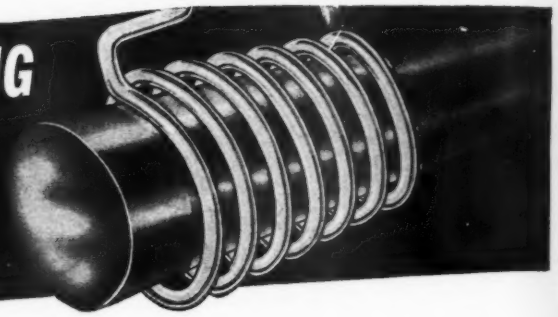
FROM A NEEDLE . . . TO

A TURBINE SHAFT

FASTER and BETTER



WITH Lepel

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BRAZING

Permits widest choice of silver or copper brazing alloys from lowest to highest melting points. Ideal for brazing carbide tips.

HARDENING

Heat localized exactly where wanted at desired temperature. Ideal for gears, cams, bearing surfaces, cutting tools and other areas that are subject to wear.

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Speedily and neatly performs intricate soldering applications with or without the use of preformed rings.

ANNEALING

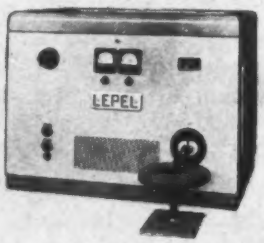
Ideal for annealing, stress-relieving, normalizing or preheating selected areas.

MELTING

Readily melts quantities of ferrous and non-ferrous metals in either graphite or ceramic crucibles.

The Lepel line of induction heating units represents the most advanced thought in the field of electronics as well as the most practical and efficient source of heat yet developed for industrial heating. With a background of half a century of electrical and metallurgical experience, the name Lepel has become the symbol for quality in induction heating equipment embodying the highest standards of engineering achievement, dependable low cost operation and safety.

If you are interested in the application of induction heating you are invited to send samples of the work with specifications of the operations to be performed. Our engineers will process these samples and return the completed job with full data and recommendations without any cost or obligation.



2½ KW INDUCTION HEATING UNIT

30 KW INDUCTION HEATING UNIT

100 KW INDUCTION HEATING UNIT

LEPEL Electronic Tube GENERATORS
1 KW; 2½ KW; 5 KW; 10 KW; 20 KW; 30 KW; 50 KW; 75 KW; 100 KW.

LEPEL Spark Gap Converters
2 KW; 4 KW; 7½ KW; 15 KW; 30 KW.

All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.

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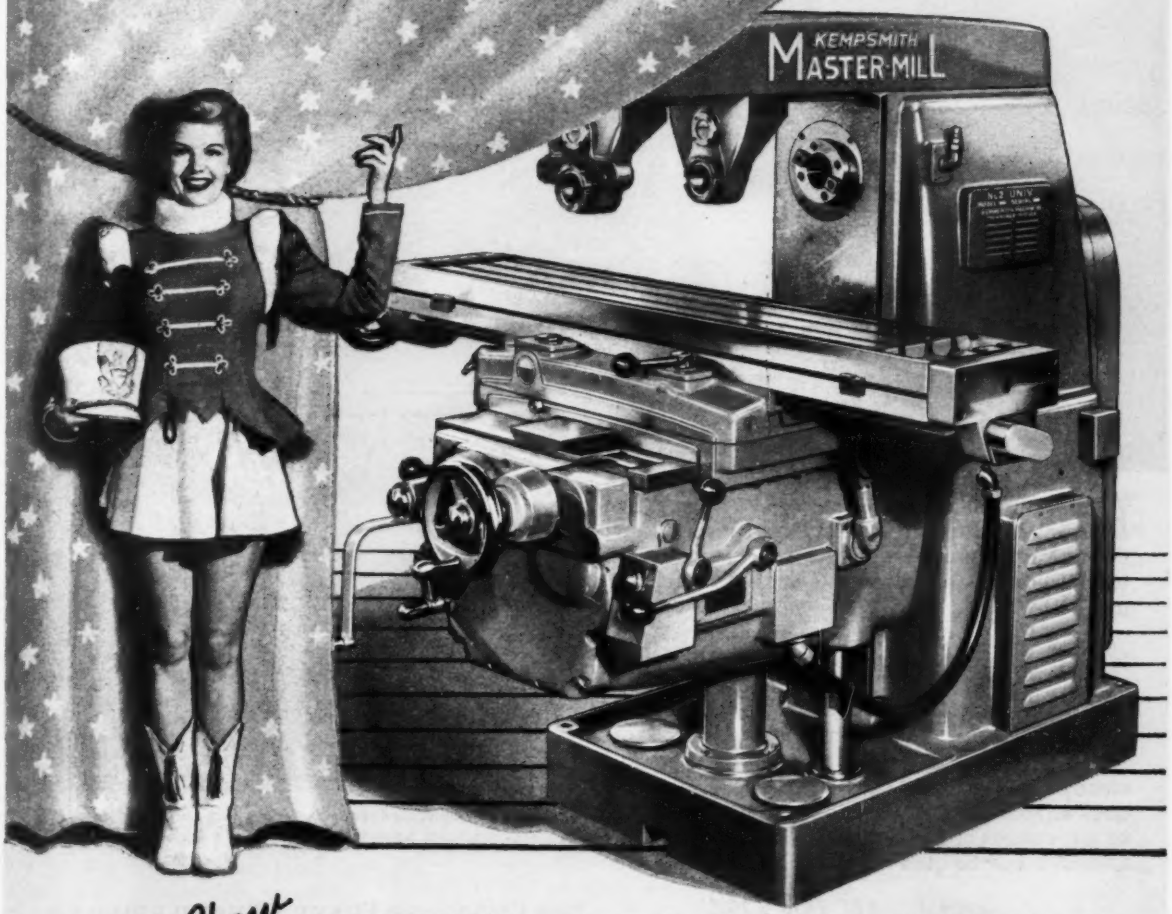
Announcing the NEW KEMPSMITH MASTER-MILL



Hit of the Show at Chicago!

MASTER-MILLS — modern machines for production and general purpose milling — cut milling costs to rock bottom by fully utilizing modern cutting tools and techniques. Conveniently located controls permit more rapid set-ups, thereby providing more cutting time. Low initial cost, plus economy of operation, assure highest return on investment. Now available in sizes No. 2 and No. 3 — Plain and Universal models. For literature, write:
KEMPSMITH MACHINE CO., 1829 S. 71st St., Milwaukee 14, Wis., U.S.A.

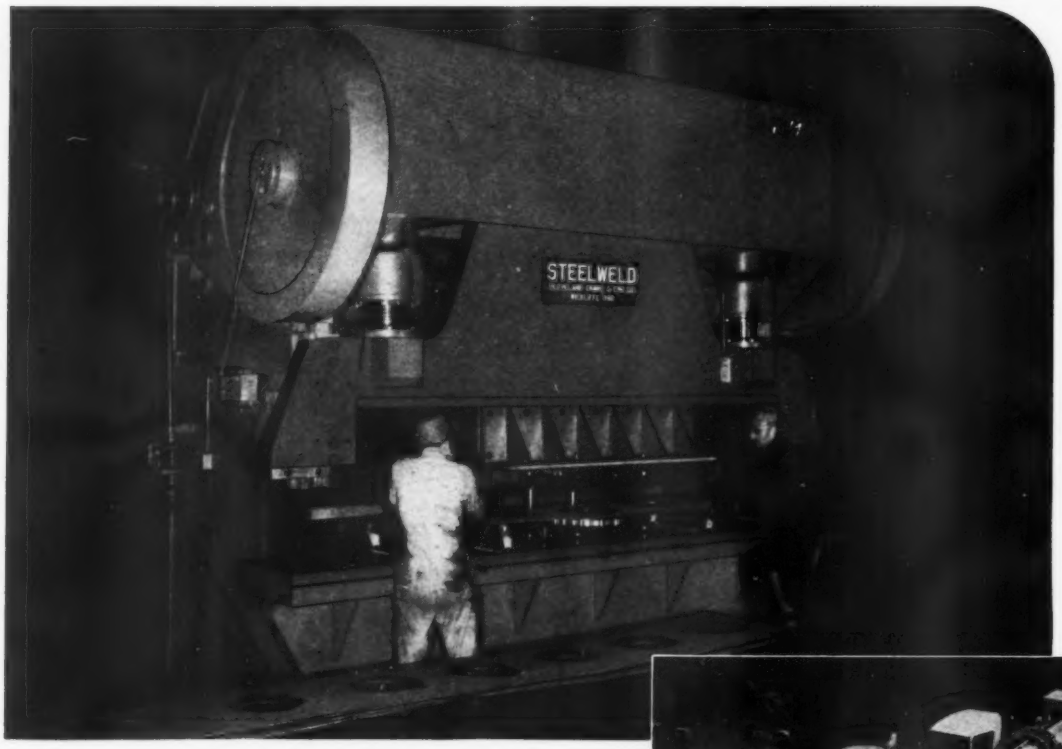
Precision-Built MILLING MACHINES Since 1888!

CIRCLE INFORM-A-GRAM KEY NO. 27

Punches 15" Holes For Warner & Swasey Gradalls

Also Performs Bending and Flanging Operations

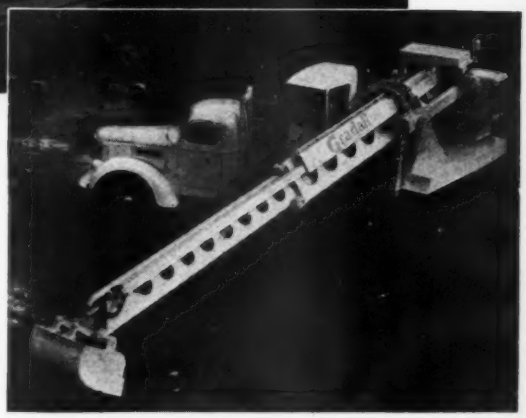
Flanging 15" diameter holes in outer boom plates of 3/16" steel. The holes were punched previously on this press.



Practically all of the steel plate on Warner & Swasey Gradalls, manufactured at their New Philadelphia, Ohio plant, is formed, punched and flanged on a Steelweld Press which is designed to brake steel plate up to 16' x ½".

One of the more interesting jobs done on this machine is the punching of 15" diameter holes in Gradall boom plates, followed by a flanging operation. Through use of special movable punches, many smaller holes of various sizes are made at a time, in locations as desired.

The versatility of Steelweld Presses to handle efficiently many varied operations has proven of tremendous advantage to many users. You, too, may find the many features of these machines of great help. A representative will be glad to give you the details.



Gradall ready for action. Has ½ yd. bucket and 24 ft. telescoping boom that lifts, tilts, and turns 360° around truck.

GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

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BENDING PRESSES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

CIRCLE INFORM-A-GRAM KEY NO. 28

. . . Month's Talk from Page 24

let our metal flow, we have never had to spot our male and female die in the press. * * * *

There is one other thing about plastics: they can be repaired very easily, fast, and it is just like a weld in steel. The die will knit itself together very readily.* * * * *

The largest production history of our dies has been in phenolic. We have built polyester dies, which I will describe a little bit to you. It takes a different approach from phenolic. Polyester is mixed cold, the same as phenolic. Catalysts are added to the resin to harden it. You can put all different types of fillers in polyester that you cannot put in phenolic. Some of these fillers are glass fibers, ground silica, china clay, atomized aluminum, magnesium silicate and calcium carbonate. As this resin has an actual shrink, it must be used with fillers and glass fibers.

When you make a die of it, it must be formed under pressure. It cannot be laid up by hand as you will probably hear described later on for some tools that take fiber glass and plastic. With polyester, we have found and a few other companies have found it has to be formed under pressure. You don't have to go on a press. We take our same type of mold, a plaster mold that has to be reinforced a little more than phenolic. We will go under air cylinders or actually go in the press if the press is idle and mix the polyester and the glass fibers and the filler and we compress that into our mold and make a solid casting of the polyester resin. There is no weldment required.

The amazing thing is that when you get all done with a block of this polyester resin formed under compression with your fillers and your glass, you are getting up awfully, awfully close to the compression strength of your cast iron.

It makes a good die. It draws well. As to whether it is better than phenolic, the technique of handling is a little easier but I don't believe as of today, that we have any better history with a polyester type of die than we do have with phenolic. It will not chip as easily as phenolic and it will not

. . . *Continued on page 42*

W&B *Carbide Drills and Reamers...*

Top Performers
FOR TRACTOR MANUFACTURER

Whitman and Barnes drills and reamers are used on many tough production operations by a well known tractor manufacturer to secure more pieces per hour, more holes per grind and longer tool life. Illustrated above is an operation utilizing carbide drills on cast iron crankshaft bearing caps. These standard 13/16" diameter W & B carbide drills are run at 290 R.P.M. and a feed of 2-1/8" per minute. It was found that high speed steel drills burned badly on this job with resulting short life. Comparatively, W & B carbide drills not only provided more holes per grind, thereby reducing down time, but increased tool life to over 10,000 holes, 2-1/2" deep. For top performance and rock bottom costs in drilling and reaming you can't beat W & B. 4382

Call your W&B distributor for best service and highest quality

He can save you money by supplying from his stock . . . what you need when you need it!

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A Completely New Machine—

designed especially for

BORING AND MILLING SMALL PIECES

for PRODUCTION WORK or ONE-PIECE JOBS

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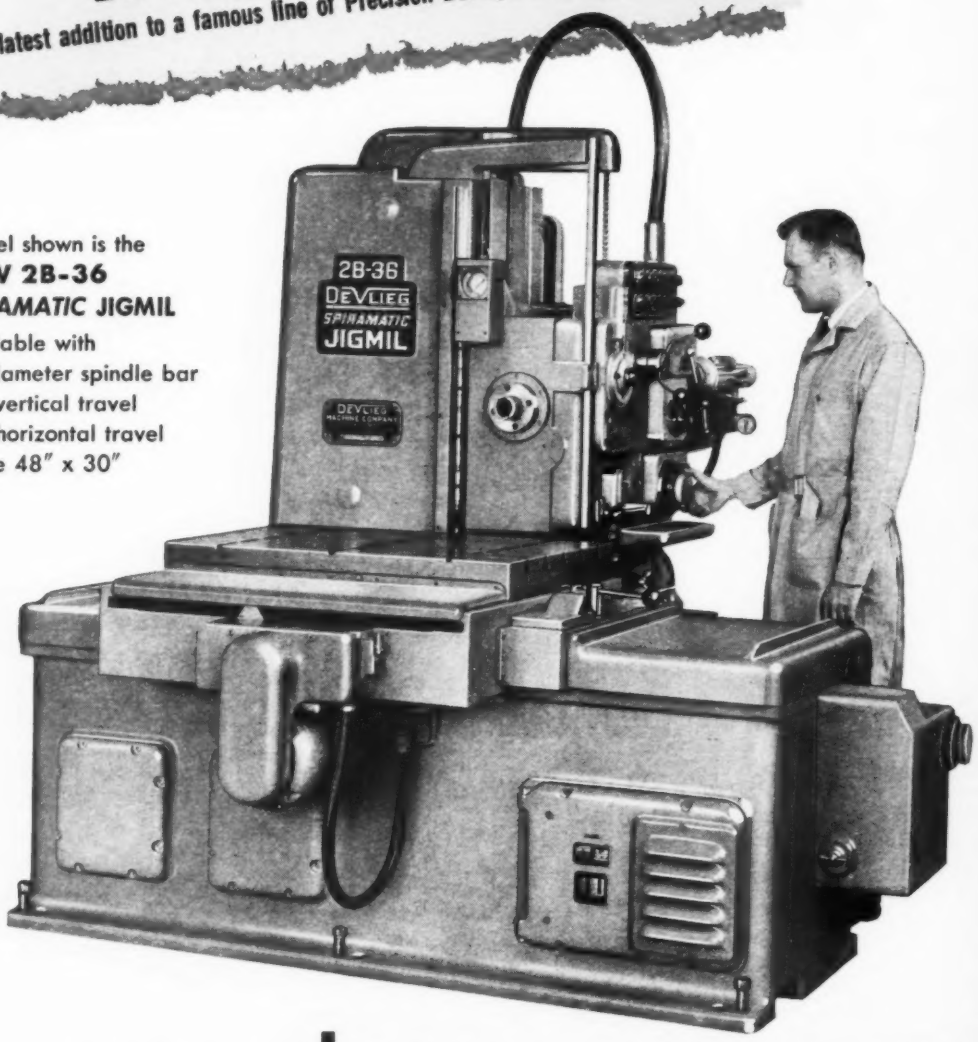
The MODEL 2B-36

DE VLIEG *SPIRAMATIC* JIGMIL

latest addition to a famous line of Precision Boring and Milling Machines

Model shown is the
NEW 2B-36
***SPIRAMATIC* JIGMIL**
available with
3″ diameter spindle bar
36″ vertical travel
48″ horizontal travel
Table 48″ x 30″



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DE VLIEG MACHINE COMPANY
450 Fair Ave., Ferndale • Detroit 20, Michigan

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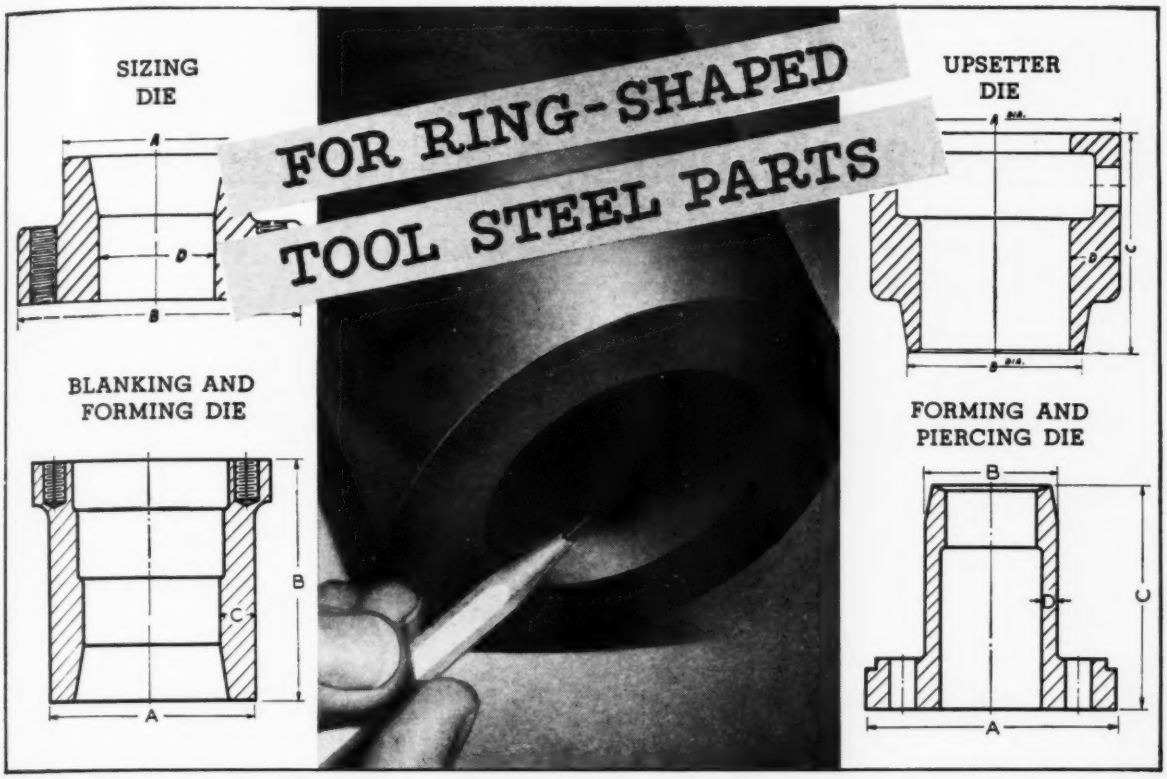

New Graph-Mo Hollow-Bar eliminates drilling, machines 30% faster

MAKERS of ring-shaped tool steel parts who use Graph-Mo Hollow-Bar will tell you it speeds up production, cuts down waste, and saves steel. That's because the hole is already in it. There's no drilling, you start with finish boring.

What's more, you get all the proved advantages of Graph-Mo that have made it one of the most popular tool steels—excellent machinability, wearability, and stability.

Graph-Mo machines 30% faster than other tool steels and has a minimum tendency to scuff or gall. The combination of free-graphite and diamond-hard carbides in its structure gives it exceptional wearability. Users report that Graph-Mo outwears other tool steels on an average of 3 to 1.

Graph-Mo also is the most stable tool steel ever made. For instance, a Graph-Mo steel master plug gage showed less than 10 millionths of an inch in dimensional change after 12 years of use. And Graph-Mo responds uniformly to heat treatment, too.

If you make ring-shaped tool steel parts, make sure you get all the advantages of Graph-Mo Hollow-Bar. Sizes range up to 16″ O.D. with a variety of wall thicknesses. It's made by the specialists in fine alloy steels, The Timken Company.

Graph-Mo Hollow-Bar is distributed through A. Milne and Co. and the Peninsular Steel Co. warehouses.

To find out more about this tool steel, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

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SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

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PORTAGE

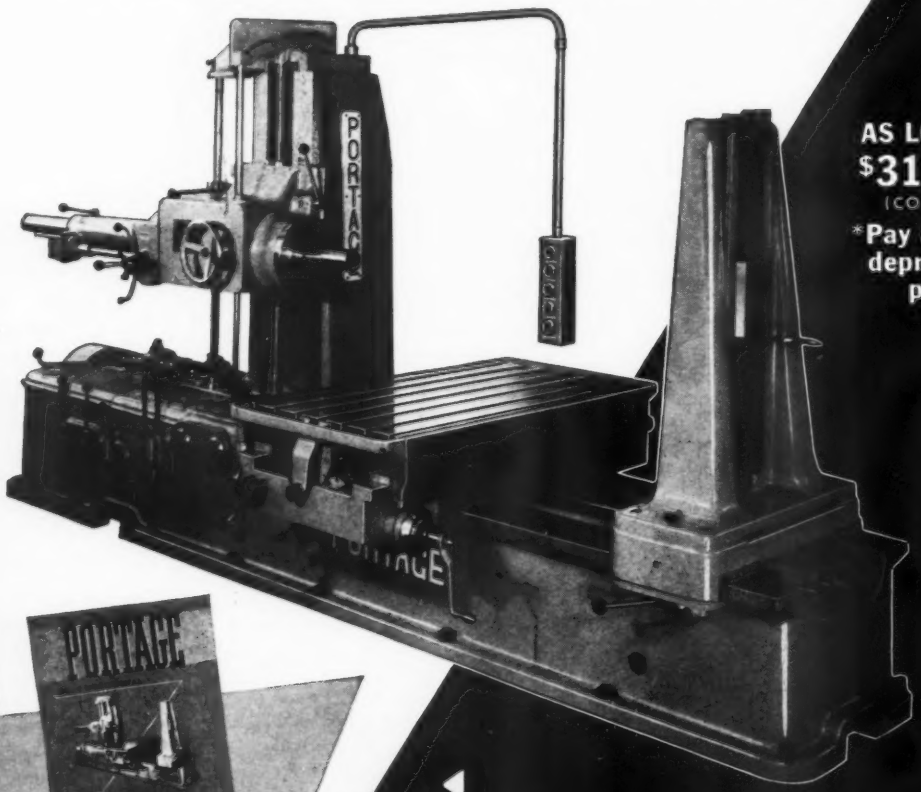
(4" Diameter Spindle)

Horizontal Boring, Drilling & Milling Machine

Outstanding . . .

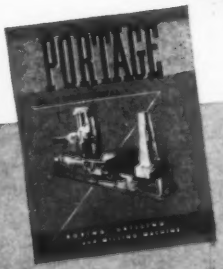
MACHINE OF THE YEAR

Unsurpassed in Price and Quality



AS LOW AS $31,358 (COMPLETE)

***Pay as you depreciate plan**



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The PORTAGE Boring, Drilling & Milling Machine offers a *real* saving in new machine investment. PORTAGE mills cost from 5% to 20% LESS than present comparable makes . . . and the amazing part of this savings is the machine itself . . . Write today for literature covering all the specifications and features on the PORTAGE Mill.

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UNIVERSAL DRILL BUSHINGS OUTLAST THEM ALL!

Several factors contribute to the long life of Universal Drill Bushings. They are machined from an unusually high quality steel. Their superfinish bores reduce wear. The blended radius on the top inside diameter helps prevent tool hang-up and breakage. 100% concentricity and hardness tests help guarantee their accuracy and uniform quality. Knurled heads provide a quick, sure grip. Available in a complete range of standard sizes and lengths. Orders for special dimensions will receive prompt attention. For complete information, write to the office nearest you — Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis. — or our home office.

180

UNIVERSAL ENGINEERING COMPANY
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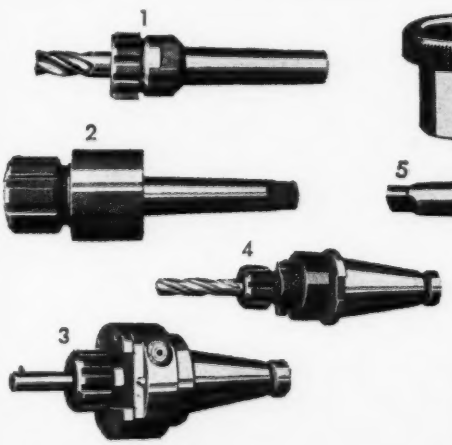
MICHIGAN



1 STANDARD COLLET CHUCK
2 FLOATING COLLET CHUCK
3 BORING CHUCK
4 "KWIK-SWITCH" TOOL HOLDER
5 MIKRO-LOK BORING BAR
6 STANDARD DRILL BUSHING
7 UNIVERSAL INDEX PLUNGER

CIRCLE INFORM-A-GRAM KEY NO. 33

Special Punches and Die Buttons

have R-B Standardized Features

You can save time in die designing, construction and use by adopting as standard the most widely accepted piercing system in the industry. This standardized R-B system efficiently answers the need for trouble-free piercing on both simple and complex applications.

Special punch-points and mating die buttons of any shape or size can be made to your specifications and will have all the features of standard R-B equipment. These inherent R-B features include: snap-action radial alignment and vertical locking of special punches and die buttons, speed and ease of insertion or removal, and complete interchangeability. Just a push, a twist and "click" the R-B punch or die button is locked in the retainer —no additional keying required. 4288

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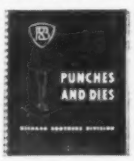

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FERROUS POWDERED METAL PARTS

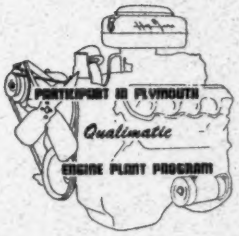
STANDARD CAP SCREWS

PRECISION GROUND PARTS

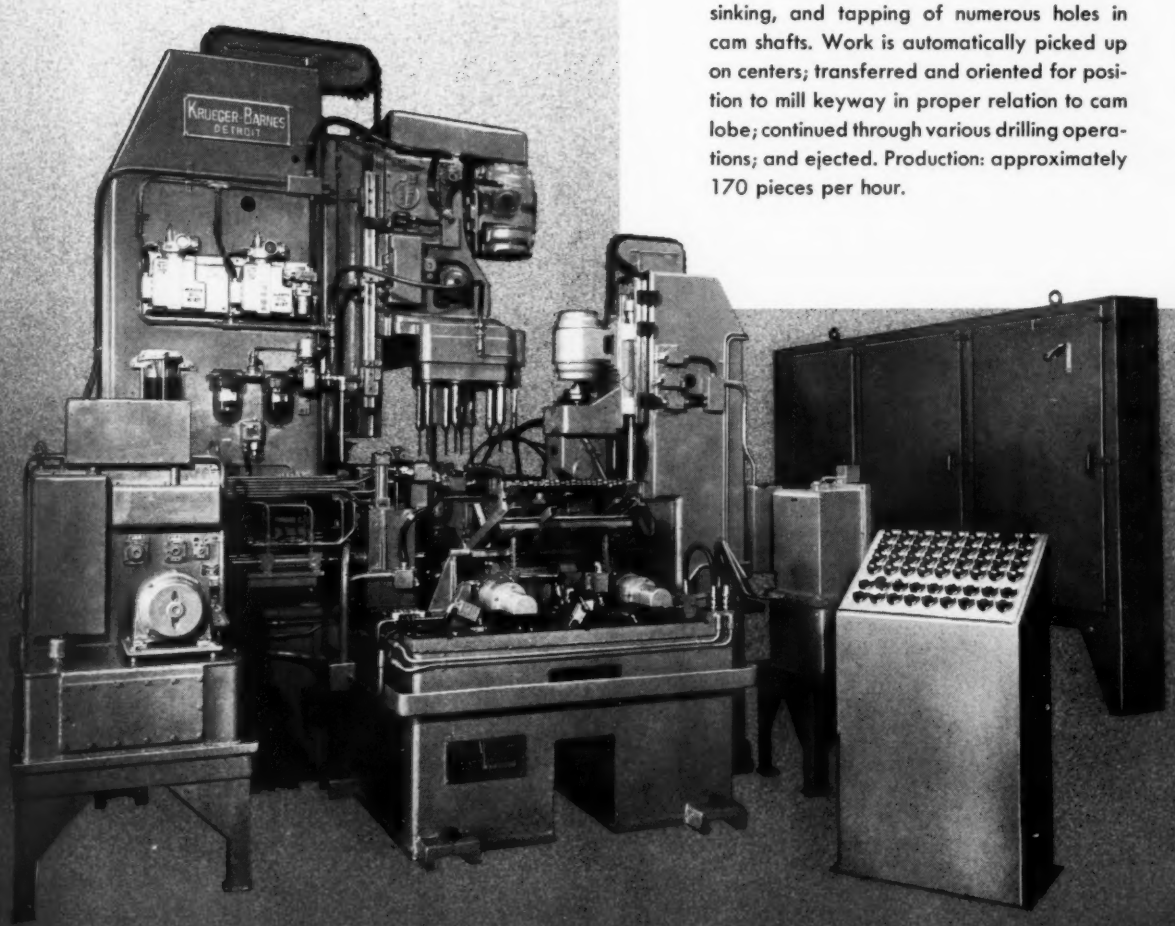
SHEET METAL DIES MADE OF FERROUS ALLOYS, ZINC ALLOYS OR PLASTICS

CIRCLE INFORM-A-GRAM KEY NO. 34

For multiple operations on Plymouth camshafts



This 18-station transfer machine performs precision cutting of keyway, drilling, countersinking, and tapping of numerous holes in cam shafts. Work is automatically picked up on centers; transferred and oriented for position to mill keyway in proper relation to cam lobe; continued through various drilling operations; and ejected. Production: approximately 170 pieces per hour.



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KB KRUEGER-BARNES CORPORATION

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Exclusive NIAGARA Electro-

A prime factor in the operating economy

● Examine it. See it operate. Try it yourself. Compare it point for point. The Niagara Electro-Pneumatic Clutch is distinctly superior in every respect: hourly output ... ruggedness ... simplicity ... safety ... savings in operation and maintenance. *It's functionally different in every major detail!*

There, in a nutshell, you have one of the principal reasons why Niagara presses continually out-perform all others. For fact-loaded details, as applied to single or double crank inclinable, gap frame, horn and deep throat presses, request specific literature and consult with a Niagara representative.

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Pneumatic Clutch

greater output, safety and of Niagara Presses

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- ENGAGES AND DISENGAGES INSTANTLY at any point in the stroke.
- CAN BE SINGLE-STROKED, JOGGED (forward and in reverse) or operated continuously.
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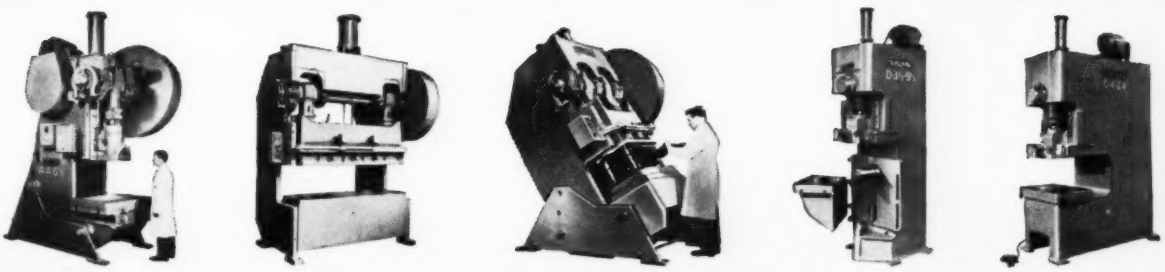
- PROVIDES EFFORTLESS PRESS OPERATION by palm buttons or foot switch.
- FAILS SAFE. Press stops automatically if electric current or air pressure fails.

For Less Maintenance

- NO FRICTION SURFACES to slip, heat up and wear.
- SIMPLE, COMPACT DESIGN. Nothing to adjust.
- LOW INERTIA. Small in diameter. Operates directly on crankshaft, *the slowest rotating shaft*. No gears nor high speed shafts, etc. to start and stop
- LENGTHENS GEAR LIFE. Wear is distributed uniformly, because engagement load is not always applied to same teeth.
- RUNS IN SEALED BATH OF OIL to minimize wear.
- EASILY ACCESSIBLE. Mounted at end of shaft, external to flywheel.
- NO BUCKING of clutch vs. brake.



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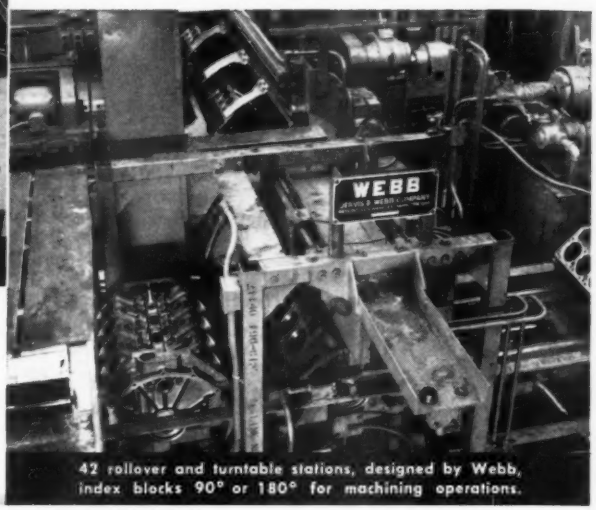
Webb Trolley Conveyors automatically transport parts and sub-assemblies to final assembly line.

MATERIALS HANDLING...



42 rollover and turntable stations, designed by Webb, index blocks 90° or 180° for machining operations.

Automation at Plymouth

Four miles of Webb Trolley type overhead transport conveyors have given the new Plymouth engine plant a higher degree of efficiency than they have ever had before. In engineering the layout for the new plant, Plymouth's goal was to achieve flexible and continuous production flow with a minimum of manual handling. Webb custom-engineered conveyor systems . . . 26 conveyor lines . . . have provided the answers for Plymouth.

Of particular interest is the high degree of automation designed by Webb engineers into the engine block production line. A Webb two-strand indexing type chain conveyor provides positive flow control for engine block production. Also, Webb engineers designed twenty rollover stations where engine blocks are automatically rotated 90° or 180° on the vertical axis to put them into position for the next machining operation. In addition, twenty-two Webb designed turntables index the blocks 90° on the horizontal axis for another machining operation.

Complicated automatic control systems and the control panels were designed and built by Control Engineering Co., a subsidiary of Jervis B. Webb Co. These control panels furnish a visual check on material flow and the operation of the conveyor systems.

This installation is another example of how manufacturers are turning to Webb conveyor engineers for answers to their materials handling problems. Regardless of your needs—single line conveyor or a complete plant conveyor system — Webb engineering service will provide the economical and efficient answer to your materials handling requirements.

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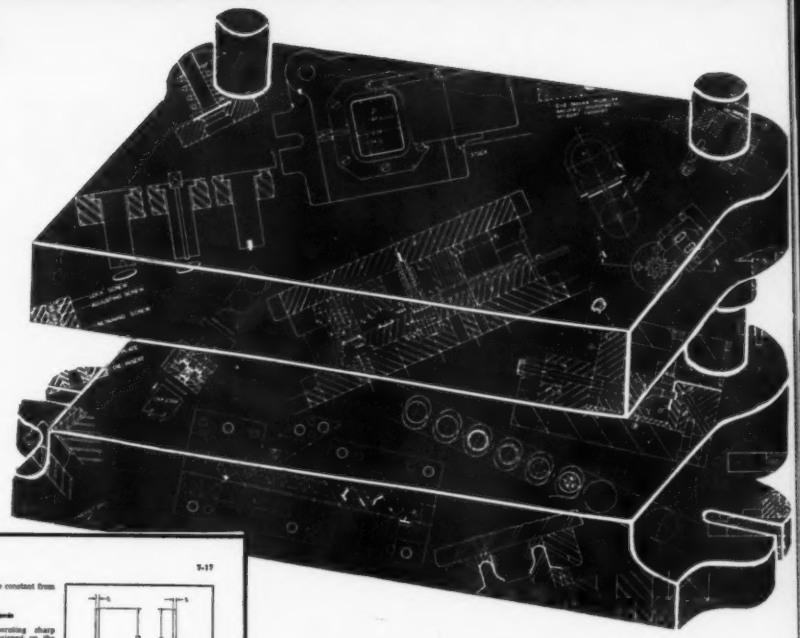

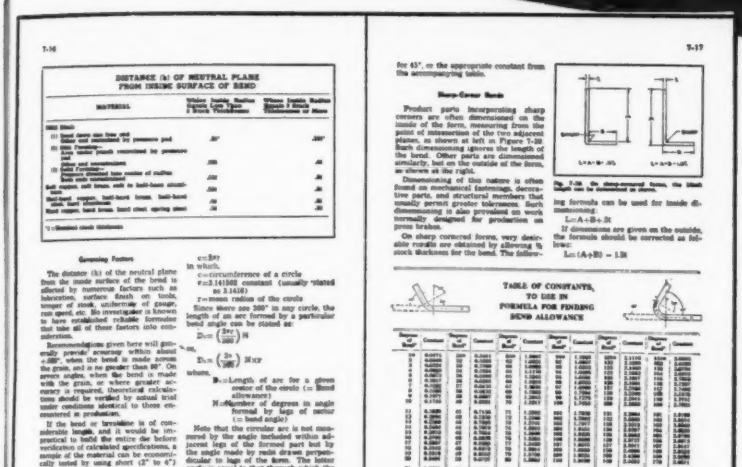

DISTANCE (h) OF NEUTRAL PLANE FROM INSIDE SURFACE OF BEND

TABLE OF CONSTANTS, TO USE IN FORMULA FOR FINDING BEND ALLOWANCE

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HIGH PRECISION NOW POSSIBLE IN VOLUME PRODUCTION OPERATIONS

240 PIECES PER HOUR

This fuse part, of No. 1213 steel, has a serpentine groove with irregular radii. Two pantograph cutters rough out and the other two finish parts in pairs. Groove is .1903" wide, plus .0014", by .109" deep, plus .003". Finish: 35 mcr.

Multiple operations with exceptional repetitive accuracy give you production-line performance on Gorton Multiple-Spindle Indexing Pantographs. From two to six different operations, performed at one setting, result in both precision and economy. Automatic cycling during engraving, milling, profiling, chamfering, counter-boring, grooving or routing.

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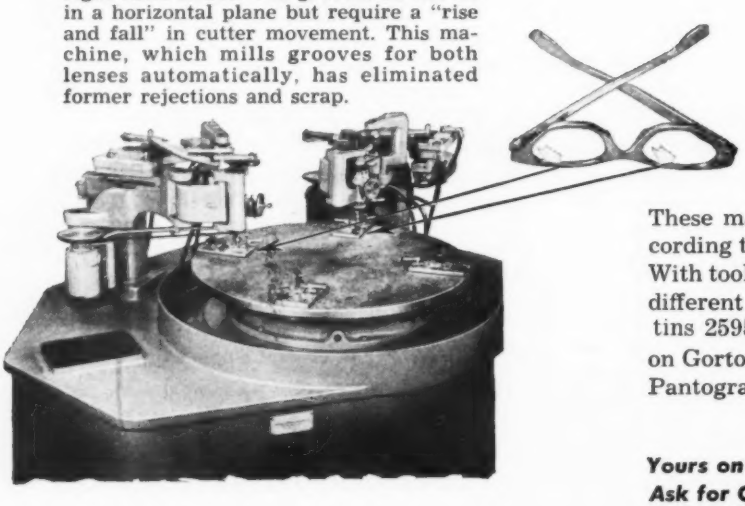
These die-cast spectacle frames have V-shaped bezels or grooves for left- and right-hand lenses. The grooves do not lie in a horizontal plane but require a "rise and fall" in cutter movement. This machine, which mills grooves for both lenses automatically, has eliminated former rejections and scrap.



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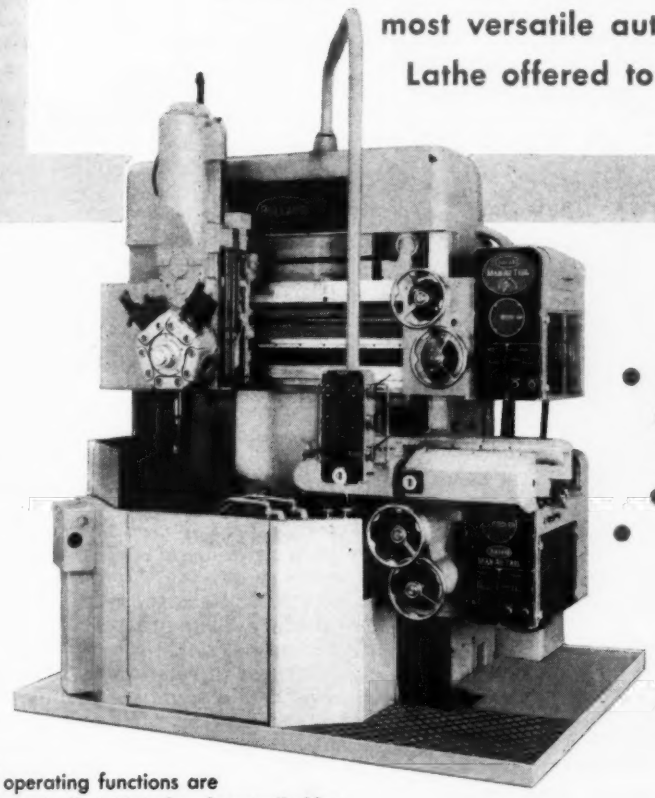

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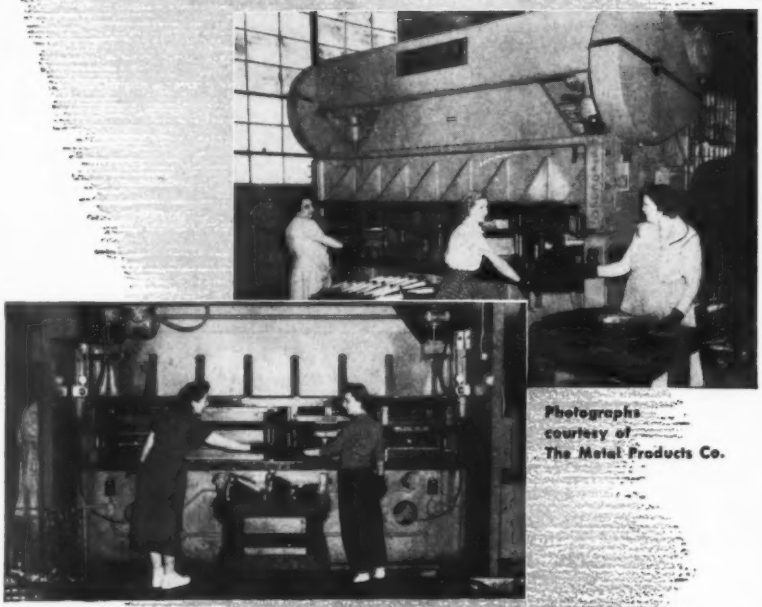
"Outperforms OTHERS 2 TO 1..."



Photographs courtesy of The Metal Products Co.

...at The Metal Products Co.
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Pressed Steel Division

To quote Mr. J. H. Frankle, Jr. of THE METAL PRODUCTS COMPANY, "We have found that press work in light gauge metals, in which there is excessive drawing, usually results in a condition of age hardening. In order to offset this, it is necessary to complete immediately all operations, otherwise there is a high percentage of breakage. By eliminating considerable handling and the use of the *continuous in line technique* we have utilized this machine to its fullest capacity. All in all, we have with this machine been able to outproduce any conventional type of press work on individual presses by at least two to one, including loss due to scrap."

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Manufacturers of Radial Draw Formers • Dies • Tools • Press Brakes • Tangent Bending Sequence Presses • Press Type Brakes • Special Machines

CIRCLE INFORM-A-GRAM KEY NO. 42

. . . Month's Talk, from page 29

for any radius any shaper than phenolic will. * * * *

There have been a lot of misstatements about plastic for tooling. It has been under-developed and over-sold, but it is here. It is going to stay with us and after all, when you think back, it took years to develop a good automobile. We are just children, just growing up in this plastic tooling thing. We are going to see more and more plastic tools as we go along. * * * *

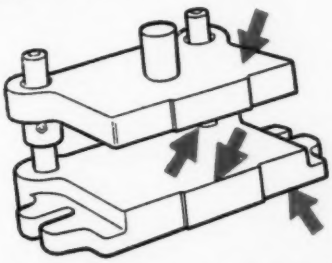
One thing you want to remember—a die is a die. You can use cheap labor in some operations with plastic tooling but it still takes a diemaker to build a die.

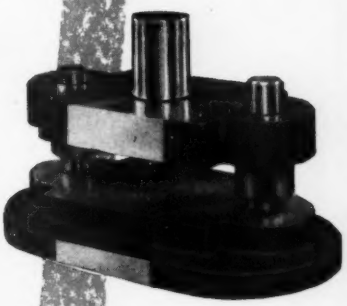
MR. TRIMBLE: There has been a need for an extremely high impact strength resin in the tool and die field. Until the appearance of polyamide resin, epoxy resins were used in the building of dies, jigs, fixtures, spotting forms, etc. The appearance of low molecular weight polyamides has changed the technique of building jigs and fixtures and has expanded the limitations of the straight epoxy resins.

Polyamide and epoxy resins have the unique feature of reacting with one another without the use of any hardening agents, activators, catalyst, etc., therefore, all that is necessary is complete mixing of the two resins with the correct fillers to obtain the maximum properties of the mixture. The greatest single inherent physical property of these mixtures in relation to tools and dies is the complete memory of this material. We mean, by memory, the ability of the material to return to its original shape after flexing or impact blows have reduced it to a new shape. In this respect, it acts similarly to some rubber but is much harder and has much higher tensile and flexural strengths.

Polyamide epoxies can be used in their cast condition without the use of any glass or other fibrous reinforcement, as the tensile and flexural strengths are high enough to withstand the normal loadings subjected in tools and dies. A typical example of the use of this material is in a door flanging fixture. In this fixture, the inner door panel is flanged around the outer door

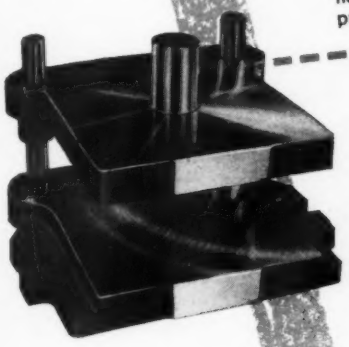
. . . Continued on page 48

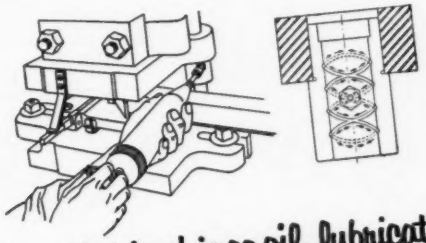




all horizontal surfaces ground

Now, in addition to the vital die surfaces of all steel or semi-steel sets, all horizontal surfaces, including tops of punch holders, are ground with the same precision that has made Danly quality the accepted standard. Surface grinding assures a flat, true working surface, saves tooling time and improves accuracy.





Shoulder bushings oil lubricated

All Danly Standard Sets equipped with shoulder bushings are designed for easy, pressurized oil lubrication. Fittings in bushing shoulder are easily reached from front or side. Cut-away sketch shows oil channels in bushing that form lubrication reservoir for long runs and maintain oil film with a minimum of clogging or gumming.

New features like these keep DANLY ahead

Throughout the years, the rigid precision standards of Danly have made Danly Die Sets the recognized standard for quality. Now Danly Die Sets offer you two new features to save hours in the die shop, make tooling-up much faster and assure longer die life. All new Danly Die Sets have an oil lubrication system for shoulder bushings and all horizontal surfaces are ground to assure a true working surface for die making. Danly's nationwide system of assembly branches is ready to serve you. Call Danly today.

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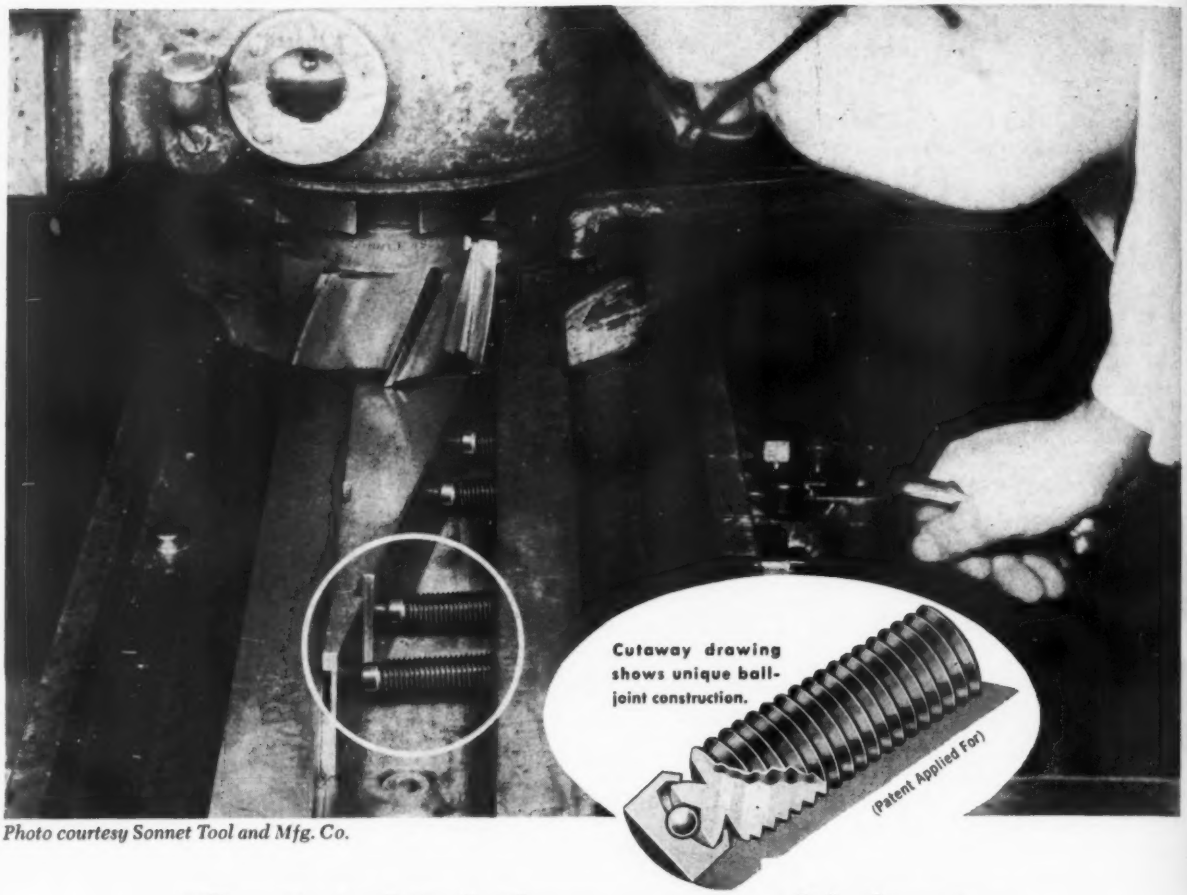

Photo courtesy Sonnet Tool and Mfg. Co.

Vlier Swivel-Pad Clamps assure solid clamping of parts in jigs and fixtures without marring their surfaces

Unique ball-joint construction prevents binding of the pad; assures automatic adjustment to off-angle surfaces

The mill fixture shown above demonstrates the usefulness of Vlier Swivel-Pad Clamps. Four Swivel-Pads are used to clamp the part rigidly in the fixture for the milling operation. Maximum rigidity is imperative in this setup if the high efficiency of the Sonnet "Helicarb" Shell-End Mill is fully utilized.

First touch of the pad against the work piece adjusts the pad face to the surface of the part and stops pad rotation. Extreme clamping pressure can then be applied to the part without damage, since screw torque is taken up by the pad, not the part. Swiveling the pad on a ball eliminates binding and assures frictionless adjustment to off-angle surfaces up to 7½ degrees each side of the center line.

Uniform clamping pressure

Design of the ball-joint causes the clamping force to be distributed equally to every point on the pad face. The pad is machined from solid stock for greater strength. The face of the pad is ground flat, not counterbored or relieved, for maximum holding surface.

Insert from either end

Since the pad diameter is less than the body diameter Swivel-Pads can be inserted in the jig or fixture from either end. This feature is especially helpful where space is limited.

Use it again and again

The body of the Swivel-Pad is made from heat-treated, alloy steel for high strength and long life. A special rust-proof finish prevents the tool from freezing in the jig or fixture.

Eliminate costly makeshift devices

These simple holding tools can save *your* tool room hundreds of dollars every year. Having them available eliminates costly machining of home-made devices and speeds tool manufacture and setups. Swivel-Pads are now available in 23 diameters and lengths. Call your Vlier distributor now and order an assortment of sizes.

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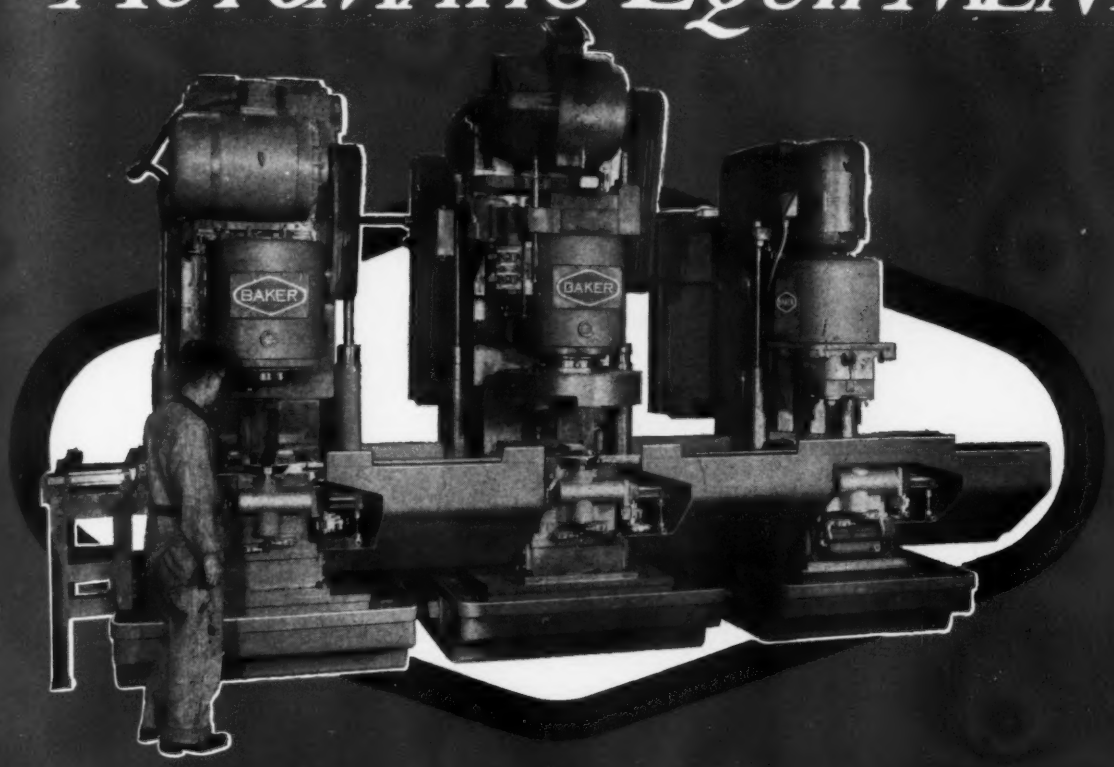

The new three standard unit Baker Machine introduced at the show, is combined to operate as a transfer machine, set up with a low cost, simplified fixture, proving the possibility of providing automatic machines through use of STANDARD MACHINES . . . And thereby achieving automation without tremendous expenditure. Operations on the new Baker Transfer are Combination Bore & Counterbore . . . Face (cross feed) . . . and Multiple Drill . . . All Automatically. Write regarding your specific job problems.

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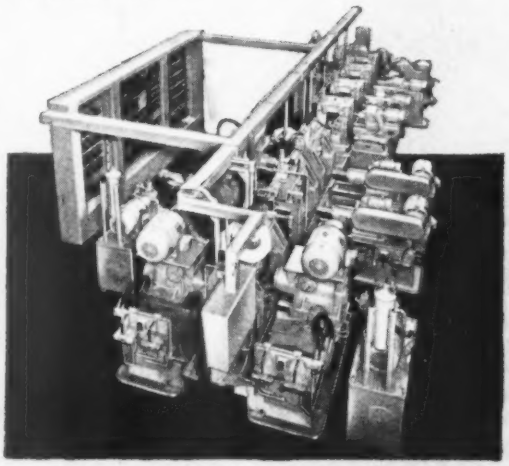
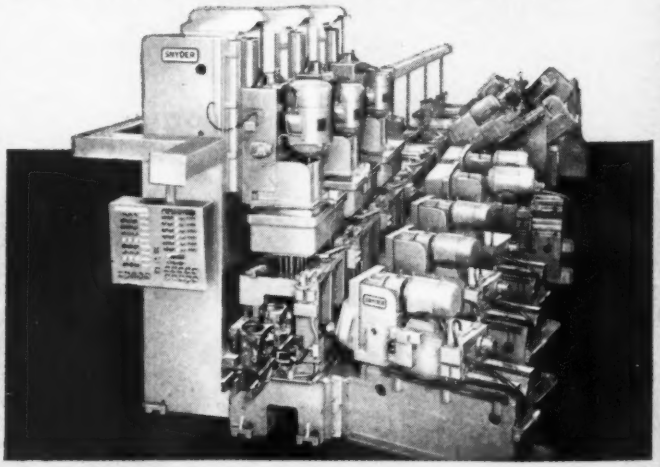
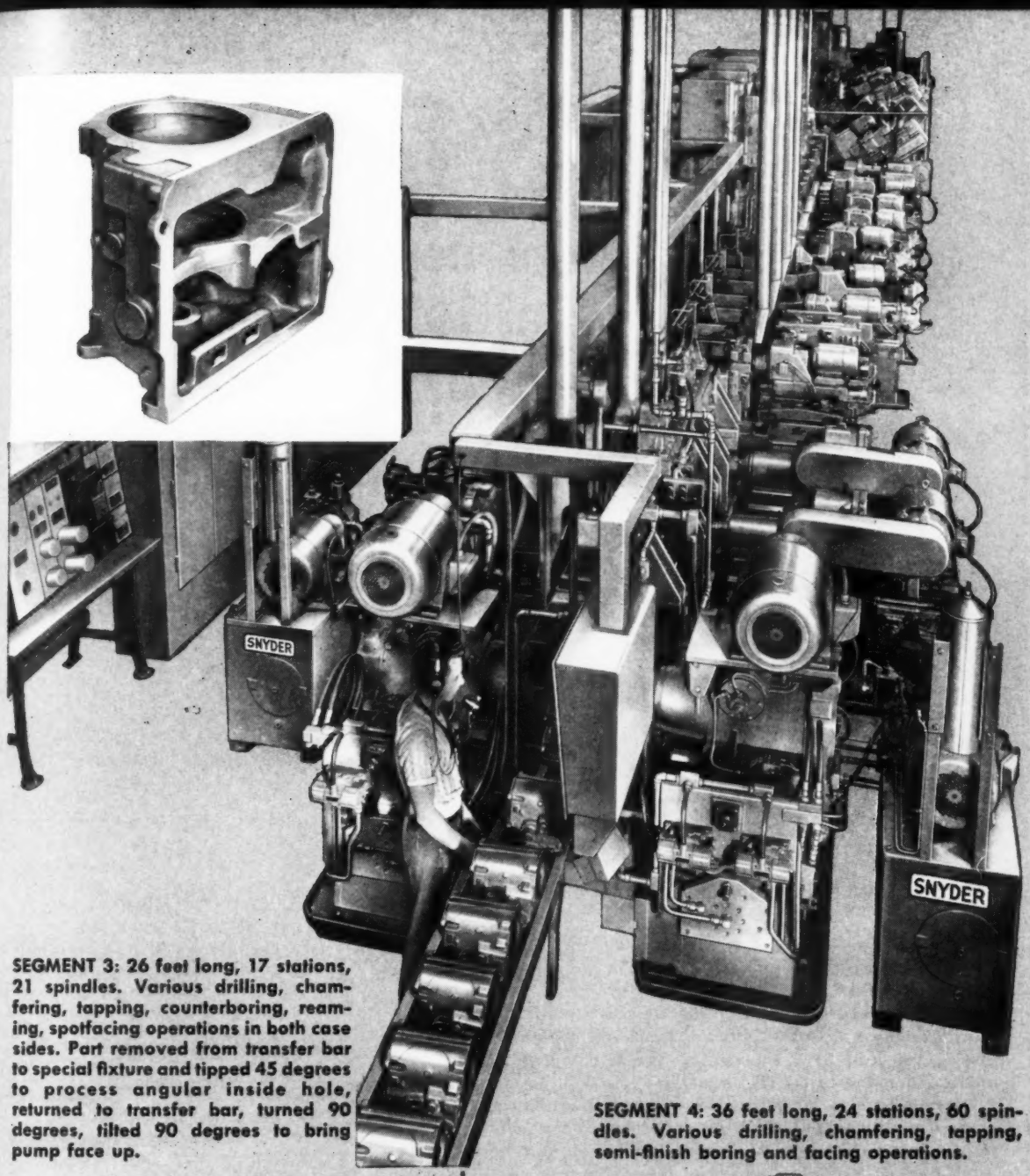
SEGMENT 1: 40 feet long, 19 stations, 10 spindles. Part manually loaded, both ends face milled, counterbored, three diameters rough and finish bored and faced, two pads side milled, pump pad face milled, clearance slot milled. Part tilted 90 degrees in processing.



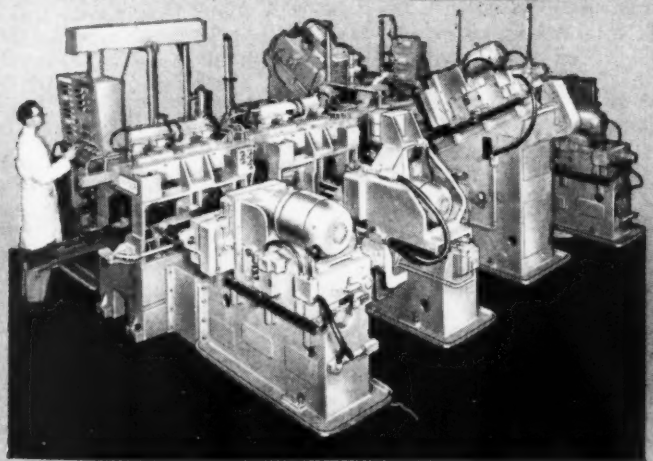
SEGMENT 2: 47 feet long, 31 stations, 91 spindles. In top face, end and at angular locations inside, 51 holes are drilled, countersunk, semi-finish and finish reamed, spotfaced, tapped. Part is tilted 90 degrees and rotated.

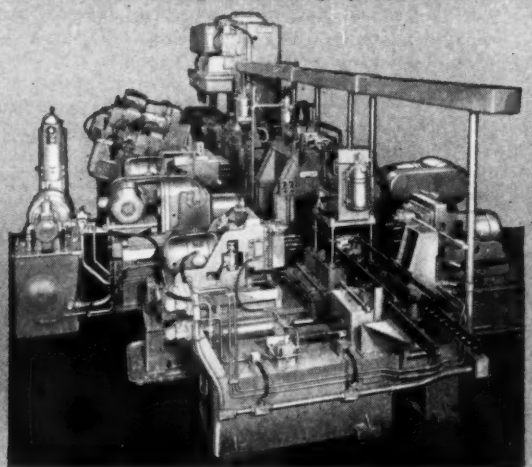


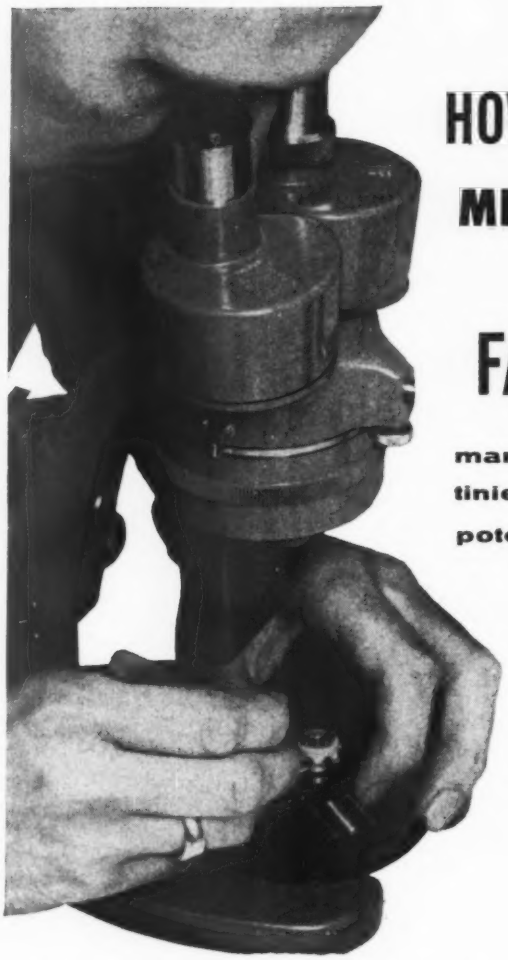


SEGMENT 3: 26 feet long, 17 stations, 21 spindles. Various drilling, chamfering, tapping, counterboring, reaming, spotfacing operations in both case sides. Part removed from transfer bar to special fixture and tipped 45 degrees to process angular inside hole, returned to transfer bar, turned 90 degrees, tilted 90 degrees to bring pump face up.

SEGMENT 4: 36 feet long, 24 stations, 60 spindles. Various drilling, chamfering, tapping, semi-finish boring and facing operations.

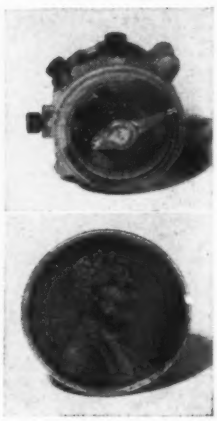






HOW 3-D MICRO-VISION HELPS FAIRCHILD

manufacture world's tiniest production-run potentiometer



In a case less than ½" in diameter, 35 sub-miniature parts are precision-assembled; hair-thin springs are welded into fine slots. This tiny unit, designed and developed by the Guided Missiles Division of Hughes Aircraft Company, is a sensing and controlling element for aircraft and missiles; critical tests must assure highest mechanical and electrical efficiency.

Fairchild Camera and Instrument Corporation attributes the efficient mass-production of this unit to the use of Bausch & Lomb Stereomicroscopes—in assembly, inspection, and quality control. "Operators have both hands free and use both eyes to obtain normal, three-dimensional vision magnified to the required power—with high efficiency and operator comfort."

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CIRCLE INFORM-A-GRAM KEY NO. 48

. . . Month's Talk, from page 42

panel by hand, with air-driven hand guns. The face of this fixture is polyamide epoxy and although the fixture was built to produce only 5000 or 6000 doors, to this date, it has run over 45,000 sets of doors without any maintenance.

The above set of fixtures costs approximately $2,500, against a cost of approximately $12,000 for steel fixtures.

In this type of operation, many times the air hammers slide underneath the door panels and pound very heavily on the face of the fixture. In steel fixtures, this face is marred or dented and must be ground down to a smooth face after repeated blows of this nature, but with the polyamide epoxy face, the air hammer did not leave a permanent dent as the resin face deforms and then conformed to its original shape.

Another typical example is a coining or re-striking die. The lower die consisted of a straight epoxy laminate and an epoxy cast backing; this half of the die was, therefore, extremely hard and rigid. The punch was made of polyamide epoxy. In this operation, the punch deformed to the shape of the lower die and set the metal in the same manner as a rubber punch would do, except that much higher unit pressures could be loaded on to the flexible polyamide epoxy punch and much closer tolerances could be obtained in the stamping. These stampings had a tolerance of minus zero, plus five-thousandths, on every 1" station line. The advantage of the method is that only the lower die shape has to be changed in bringing the tool into the production tolerances, as the polyamide epoxy punch will deform to the given shape without any manual grinding or scraping of the punch.

There are some drawbacks to this material. These drawbacks are those of mixing and handling the material. It is a material which is considered high in viscosity relative to the epoxy resins that are generally used in the tooling field. It traps air readily and is very tenacious and sticky. It must be mixed very slowly. (The ratios of mixing are 40% epoxy, 60% polyamide.

. . . Continued on page 50

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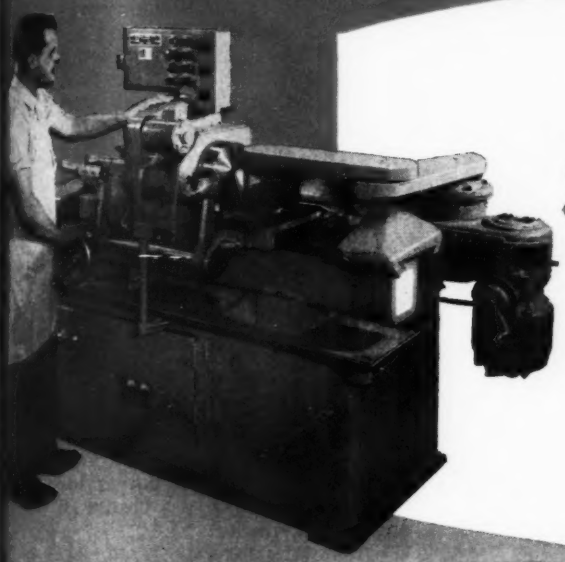

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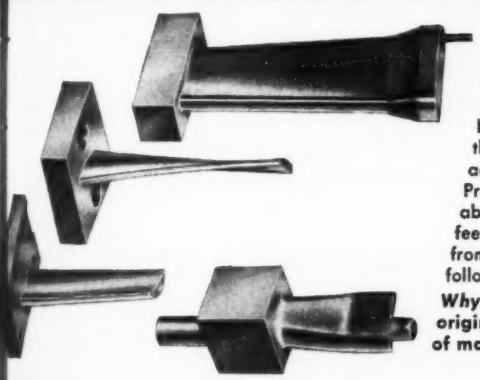
- *IN HOURS INSTEAD OF WEEKS*

NEW MODEL 102 electronic AIRFOIL MILLING MACHINE



Heretofore original masters were made by hand — no generating method being available. Now, in a matter of hours rather than weeks, the first master can be produced — hours in a single machine rather than weeks of skilled bench work. Simple templates, made to represent designer's airfoil cross-sections, together with data on drawing, are the only "special tools" needed by the machine. True fairing between and beyond the designated cross-sections is automatically produced by the machine interpolation systems. *True* fairing of shape and of twist-of-shape is accomplished automatically.

Principal motions of workpiece during generation of master airfoil are: (1) rotation about axis, (2) high-speed motion of milling head to and from axis, and (3) slow feed of milling head parallel to axis. Signals to produce motion (2) are obtained from the completely new NON-CONTACTING tracer control, which always exactly follows, *but never contacts* the constantly changing interpolation "flexure".

Why not use this method to generate the whole airfoil surface on your original airfoil masters — and, in addition, to provide a convenient means of machining pilot production runs?

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. . . Month's Talk, from page 48

plus fillers, to 40% polyamide and 60% epoxy, plus fillers.) When the percentage goes toward the use of more polyamide, the material becomes softer and more flexible. The heat distortion point is lowered. When more epoxy is used, the material is harder and tends to be brittle, although never as brittle as an unmodified epoxy resin.

We have successfully made an original model of the mixture of polyamide epoxy and filler and the material seems to have an excellent future along model making lines. The pattern makers used their normal woodworking equipment and tools and because of the ease of machining were able to machine to the final shape in a shorter period of time.

Unlike mahogany, there is no grain to this material and it can be worked in any direction with plain spoke shaves and scrapers. It is also possible to mold polyamide into board stock and then fabricate the boards into a final given shape, such as is done with mahogany.

The polyamide epoxy will certainly find a place in the plastic tooling industry and with the help of the resin manufacturers in reducing viscosities of resins and increasing reactivity rates, I am sure that the polyamide epoxies will capture a corner of the tooling market. * * * *

MR. RUDDIMAN: You have heard described here this afternoon the uses of the three basic plastic materials: the phenolic, the epoxy and the polyester, and the new material polyamide with epoxy. You may have the idea that plastics are confined to dies. I will try to point out this afternoon why so many more pounds of material are used in the construction of supplementary tooling than used in the actual die construction.

In this supplementary tooling we have two distinct types. We have the permanent tooling that can be used or is intended to be used throughout the life of the program, and the temporary tooling that is used just during the construction of the dies themselves.

Mahogany has long been the standard for the making of good models. We all know the difficulty that you have, due to climatic changes, holding a dimen-

. . . *Continued on page 60*

Maneuverability...

...WHEN YOU NEED IT MOST

In the best regulated plants there are times when in-going and out-going shipments represent a real "bottleneck" . . . production lags and customers' delivery suffers! The maneuverability of a Moto-Truc is the answer for many plants with limited trucking facilities. The Moto-Truc line offers the most compact electric powered trucks in the world . . . yet can handle up to 10,000 pounds.

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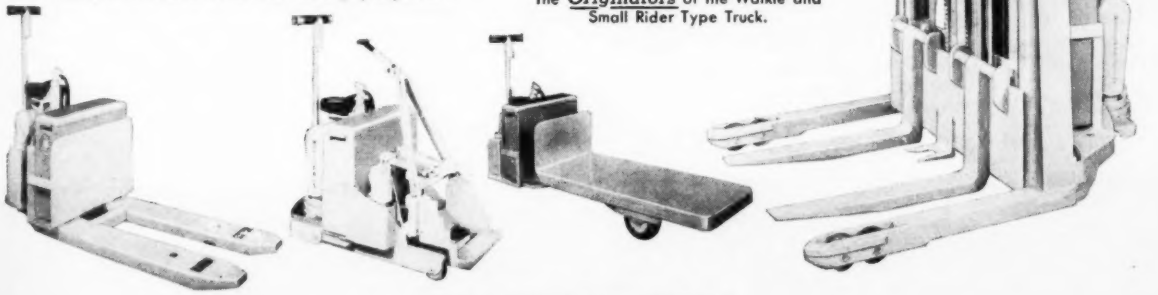
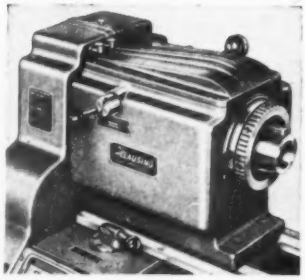


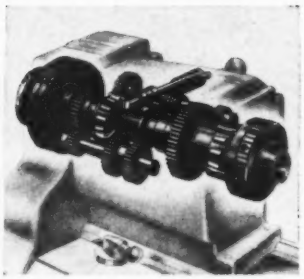
CIRCLE INFORM-A-GRAM KEY NO. 51

CLAUSING LATHES

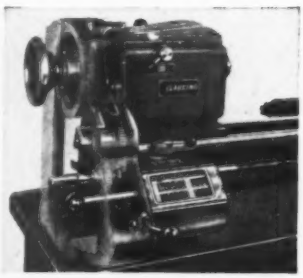
YOUR CHECK LIST OF LATHE VALUE



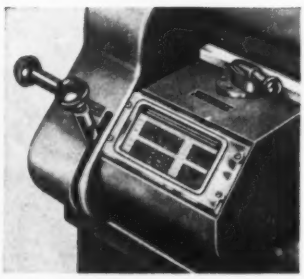
☑ Is headstock fully enclosed with gears traveling in oil bath?



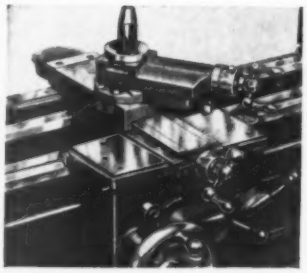
☑ Does spindle turn on widely spaced "Zero-Precision" Timken tapered roller bearings?



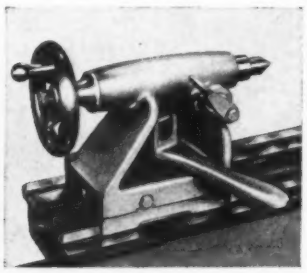
☑ Does it have fully enclosed dual-belt outboard drive with quick, easy belt replacement?



☑ Is Quick-Change box fully enclosed with gears and shafts running in bath of oil?



☑ Is automatic apron fully enclosed with entire mechanism running in sealed oil bath?



☑ Does tailstock have No. 3 M.T. ram with tang socket and permanently attached swing type wrench?

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Within its price range and capacity the CLAUSING 6300 series lathe sets the standards for Precision, Performance and Economy!

Its exceptional performance on production, tool room, maintenance and laboratory work is the direct result of its many advanced and exclusive features of design and construction.

For example, the 6300 headstock is fully enclosed and all moving parts run in a pumped bath of oil. Spindle is forged, precision-ground steel with 1⅜" bore and 1" collet capacity . . . turns on "Zero-Precision" Timken tapered roller bearings. Hardened and ground spindle nose is L-00 tapered key-locked type. Dual A-belt drive with spindle pulley mounted outboard . . . you can replace belts quickly without having to remove spindle. Quick-change mechanism provides instant selection of 48 threads or feeds. Both quick-change mechanism and double-walled apron are enclosed and gears and shafts run in bath of oil. The heavy-duty tailstock has No. 3 M.T. ram with tang socket.

What's more, the superior performance of the 6300 is assured! Before it leaves the factory, each CLAUSING Lathe must pass rigid tolerance tests such as:

1. Spindle Nose Runout, total indicator reading..0 to .0003".
2. Spindle Taper Runout, at end of 12" test bar....0 to .0006".
3. Headstock Alignment (horizontal) at end of 12" test bar.....0 to .0003".
4. Tailstock Spindle Alignment (vertical) high at end of spindle when fully extended.....0 to .0008".
5. With work mounted in chuck, lathe must turn round within .....0 to .0003".

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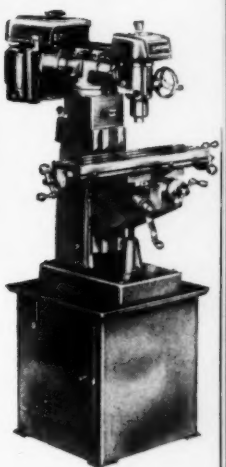

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CONDENSED SPECIFICATIONS

CAPACITY — Swing: 12¾" over bed; 12⅜" over saddle wings; 7⅝" over saddle. 21½"-33½"-47" between centers. Beds: 47"-59"-72½".

BED — 7⅜" wide, 5⅛" deep. Two Vee, two flat ways and underside of bed are precision-ground.

THREAD RANGE — 48 selections, 4 to 224 Standard, right or left.

SPINDLE SPEEDS — Countershaft Drive, 8 (50-1300 R.P.M.). Variable Speed Drive, Infinite (30-1400 R.P.M.).

POWER LONGITUDINAL FEEDS — From .00065" to .0367" (left or right) per revolution of spindle.

LEAD SCREW — ⅞" diam., 8 Acme threads per inch.

CROSS FEEDS — From .00016" to .00917" per revolution of spindle. Cross feed travel is 9⅛".

SPINDLE — Tapered Key-type, A.S.A. — L-00. 1" collet capacity. Internal taper, No. 4½ M.T. 1⅜" bore sleeved for No. 3 M.T.

COMPOUND REST — Graduated 0 to 90° right and left. 2 9/16" travel.

COUNTERSHAFT DRIVE — Countershaft has ball bearing equipped shaft, 2-step drive pulley, ½" A-section belts. 4-step motor pulley with ¾" diam. hole. ¾ or 1 HP, 1725 RPM motor recommended.

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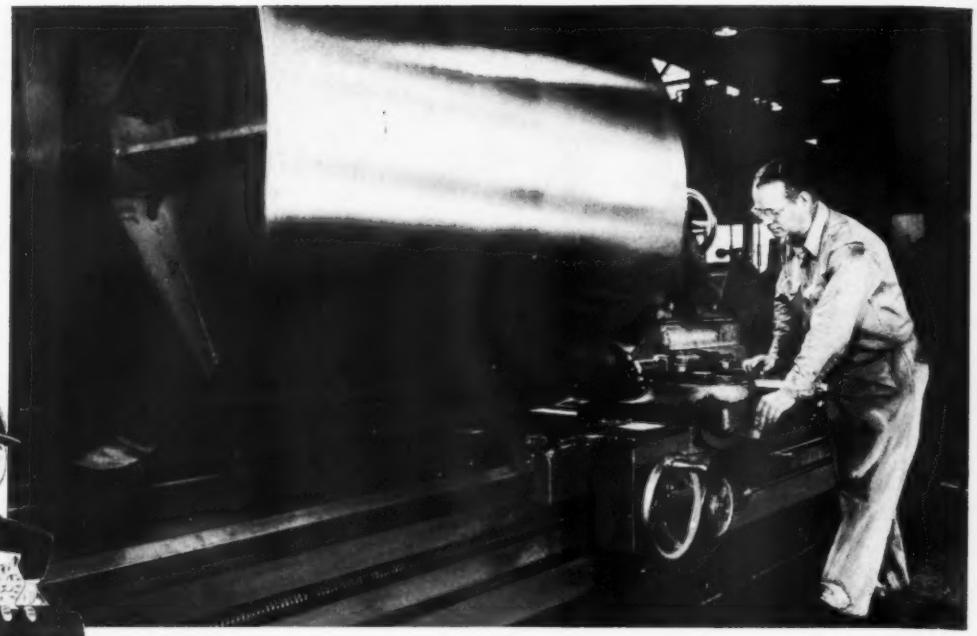

Photo, courtesy Commercial Machining Company, Conway, Pa. Turning 60" dia. stainless steel looping line roll.

Mr. Tooley Says:

"There's more than one way to skin a cat"

CIRCLE "C"

SUPER HIGH SPEED STEEL

- Operating speeds 25%—50% faster than ordinary high speed steels
- Longer tool life
- Cuts costs by increasing production
- Particularly suitable for cutting tough alloy and stainless steels

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STANDARD TIPS, TOOLS, INSERTS AND HOLDERS

- Highest metal removal rate
- Uniform, dependable Firthite quality and performance
- Large stocks of standard tools and tips for immediate delivery
- Mechanically-held and brazed designs

Yes, in the field of tooling, alternative cutting materials make it possible to utilize the same production equipment for a variety of applications. In typical turning operations either Firth Sterling High Speed Steel or Firthite Sintered Carbide cutting tools may be selected . . . depending upon the characteristics of the metal and the production requirements of the job.

Firth Sterling, manufacturers of complete shop tooling needs, occupies the unique position of providing *both* steels and carbides to "skin the cat" of production in the most economical and effective ways. Thus, from *one* dependable source of supply you are assured of (1) completely unbiased tooling recommendations and, (2) the selection of the exactly right carbide or steel or *both* to provide maximum production!

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CIRCLE INFORM-A-GRAM KEY NO. 54

The right file for the job plus the right service to make it count

When industry was younger, it gave less thought to files and filing. One file often did many jobs. Time, labor, types of material, character of operations, rejects and other filing-production factors were seldom calculated with today's close eye to costs.

Nicholson long ago recognized the growing importance of these cost factors in modern shop practices. Into the metallurgical laboratories, machine and tool shops, and assembly plants, went Nicholson research and design engineers — to study filing techniques and problems.

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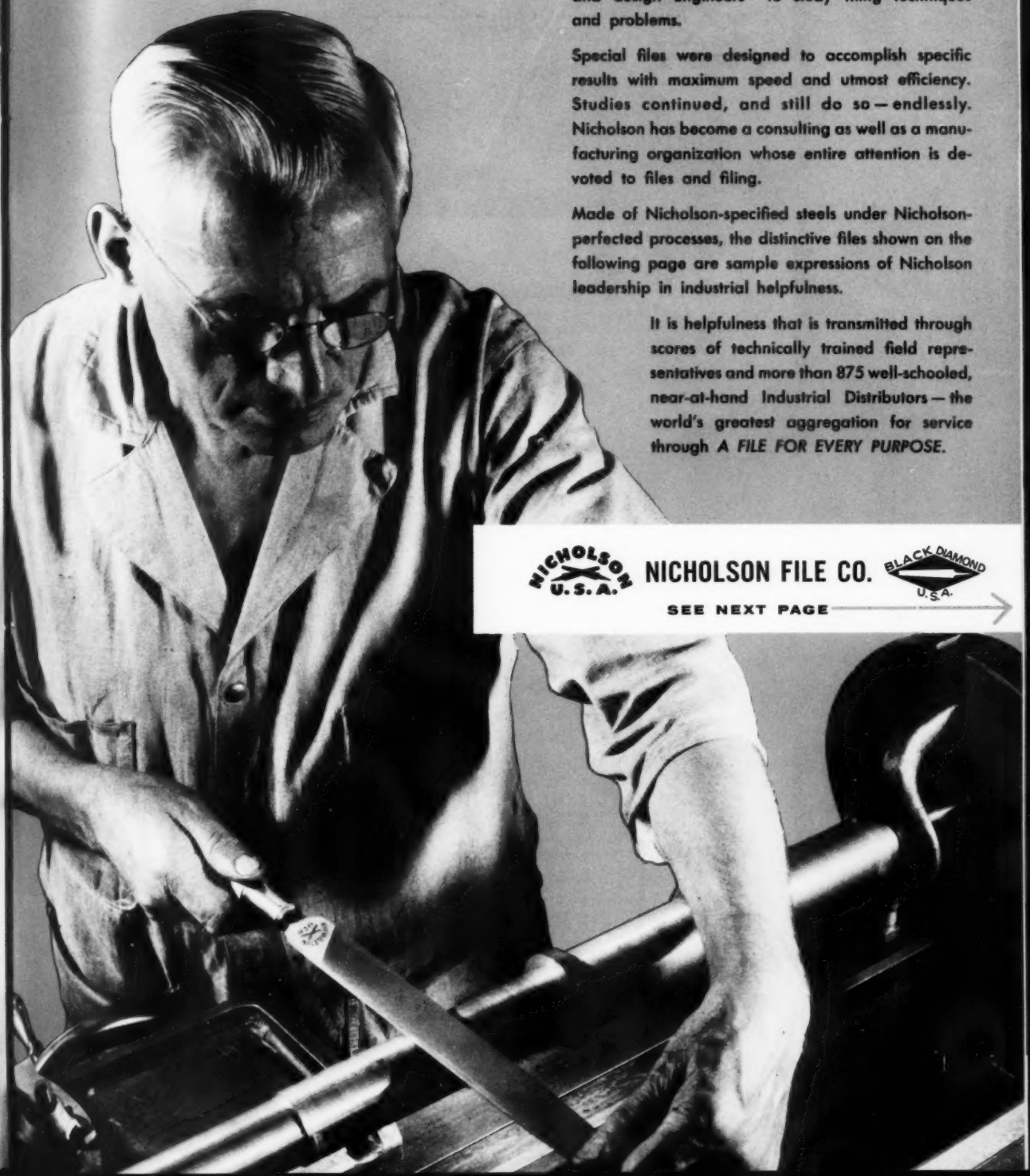
Made of Nicholson-specified steels under Nicholson-perfected processes, the distinctive files shown on the following page are sample expressions of Nicholson leadership in industrial helpfulness.

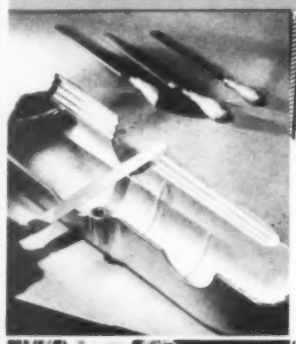
It is helpfulness that is transmitted through scores of technically trained field representatives and more than 875 well-schooled, near-at-hand Industrial Distributors — the world's greatest aggregation for service through *A FILE FOR EVERY PURPOSE.*



NICHOLSON U.S.A. NICHOLSON FILE CO. BLACK DIAMOND U.S.A.

SEE NEXT PAGE

See your Industrial Distributor for truly helpful service in choosing and using the right file for the job



ALUMINUM "A" *(left)*
Special teeth cut fast, finish well, avoid clogging

STAINLESS STEEL *(right)*
Has exceptional wearing properties for this tough metal

FOUNDRY *(left)*
Extra-sturdy teeth for rough work like snagging castings

LONG-ANGLE LATHE *(right)*
Gives cleaner shearing and clearing than ordinary files

BRASS *(left)*
Sharp, long-angle teeth eliminate grooving and clogging

SWISS PATTERN *(right)*
Precise filing of dies, patterns, etc., in many types and cuts

SHEAR TOOTH *(left)*
Cuts fast and smooth; ideal for soft metals, plastics, wood

SUPER-SHEAR *(right)*
Smooths as it removes metal—practically two files in one

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NICHOLSON

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23 Acorn Street, Providence 1, Rhode Island
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AIR-POWERED RAPID TRAVERSE
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A Bellows Drill Press Feed quickly turns any standard manually operated drill press into an automatic or semi-automatic drilling unit—with full precision control over every phase of its operation.

A touch on the operating control and the drill rapidly advances to the work, is fed through the work under smooth hydraulic control, and returns to starting position. Cycling can be single or continuous. It can be electrically interlocked with work feeding and work holding devices.

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More than 10,000 companies use Bellows Drill Press Feeds. In some plants as many as 400 Feeds are in everyday use—drilling, tapping, reaming, counter boring, threading—building production records that are hard to believe unless you use Bellows Drill Press Feeds yourself.

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FOR FASTER, SAFER, BETTER, AND LOWER COST PRODUCTION

CIRCLE INFORM-A-GRAM KEY NO. 57

Tool Steel Clinic on Two Feet

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Your local Milne man is a tool steel specialist, trained to help you solve your tool material problems. He's an expert in tool steel characteristics and applications who can help specify exactly the right steel for the job.

He represents MILNE, America's Leading Tool Steel Specialists. That means he has a tremendous range of grades, sizes, shapes and finishes of tool steel to draw upon, including many unusual ones that are hard to find elsewhere.

Milne has grown up in the tool steel business. Its CONCENTRATION and SPECIALIZATION on this field is reflected in the variety of its warehouse stocks and the special knowledge in the minds of its representatives.

If tool steel is involved, call in a specialist . . . call MILNE.

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NEW TOOL
STEEL SELECTOR

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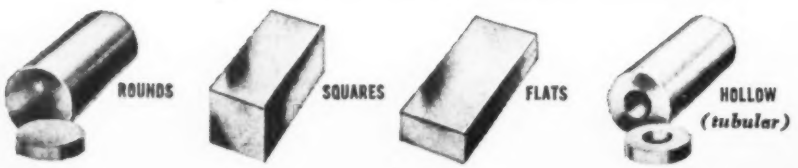

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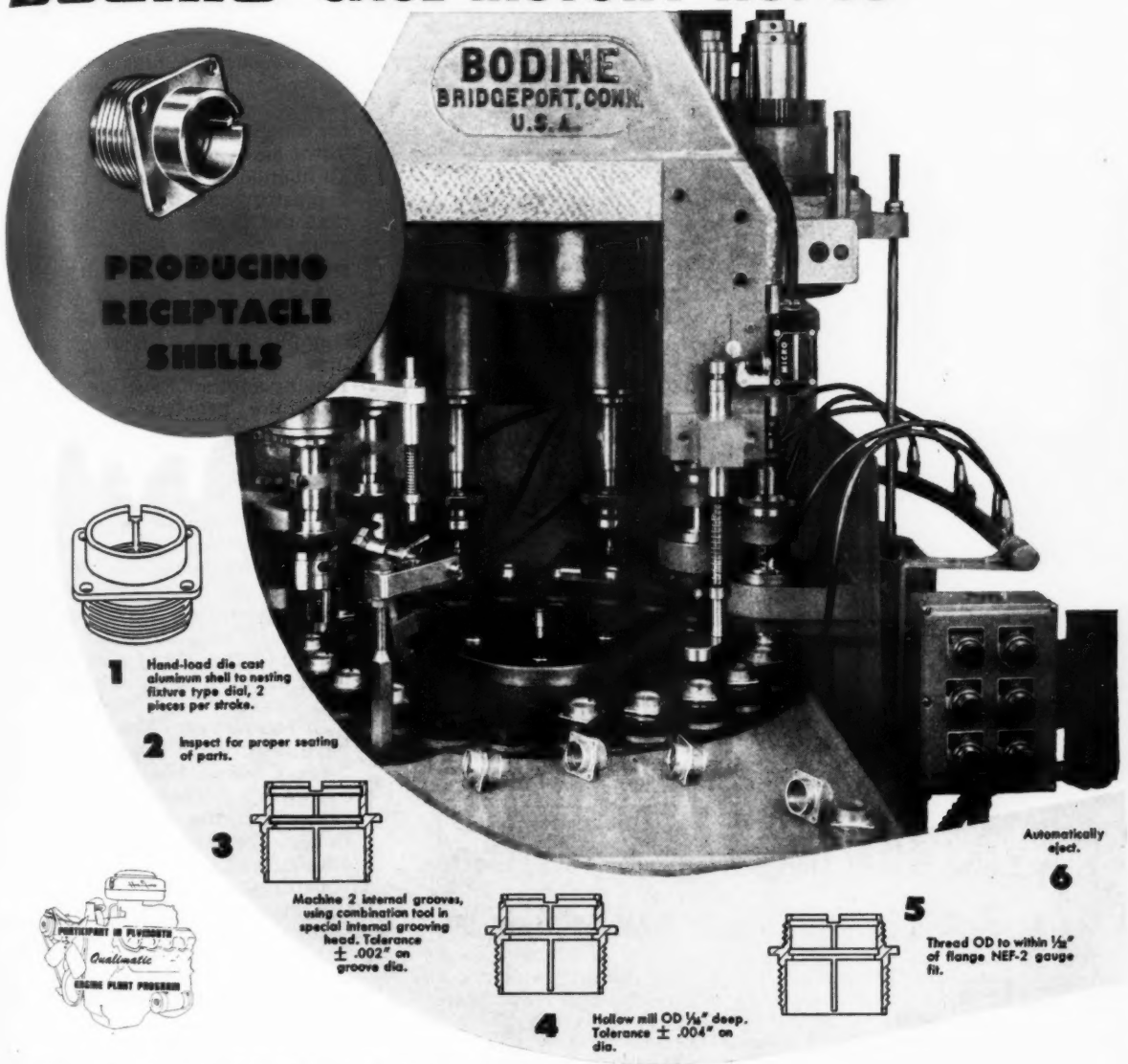
CIRCLE INFORM-A-GRAM KEY NO. 58

Bodine CASE HISTORY NO. 38


PRODUCING RECEPTACLE SHELLS
BODINE
BRIDGEPORT, CONN.
U.S.A.
1 Hand-load die cast aluminum shell to nesting fixture type dial, 2 pieces per stroke.
2 Inspect for proper seating of parts.
3 Machine 2 internal grooves, using combination tool in special internal grooving head. Tolerance ± .002" on groove dia.
4 Hollow mill OD 1/16" deep. Tolerance ± .004" on dia.
5 Thread OD to within 1/32" of flange NEF-2 gauge fit.
6 Automatically eject.
Qualimatic
ENGINE PLANT PROGRAM

This Bodine Model 48-30 machine is tooled to handle 13 receptacle shells ranging from 7/8-27 to 1 5/8-18 NEF 2 threads. Shells are used for multiple terminals in TV, Radar, etc.

PRODUCTION: From 1,600 to 2,200 pieces per 50-minute hour, depending on size of shell.

Potentiometers next to push button station regulate two electronically controlled variable speed motors. Positive, accurate control over spindle rpm and over rate of feed gives lead-screw accuracy to the threads with a non-reversing spindle.

Bodine machines (of four types) may be tooled for an extremely wide variety of high speed repetitive production jobs . . . including drilling, tapping, threading, screw inserting, light milling, and assembly. For a true picture of cost cutting, write Dept. TP-10 for our brochure "Bodine Presents 12 Typical Case Histories."

"You Can't Meet Tomorrow's Competition with Yesterday's Machine Tools."

THE Bodine CORPORATION
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AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING AND SCREW INSERTING MACHINES

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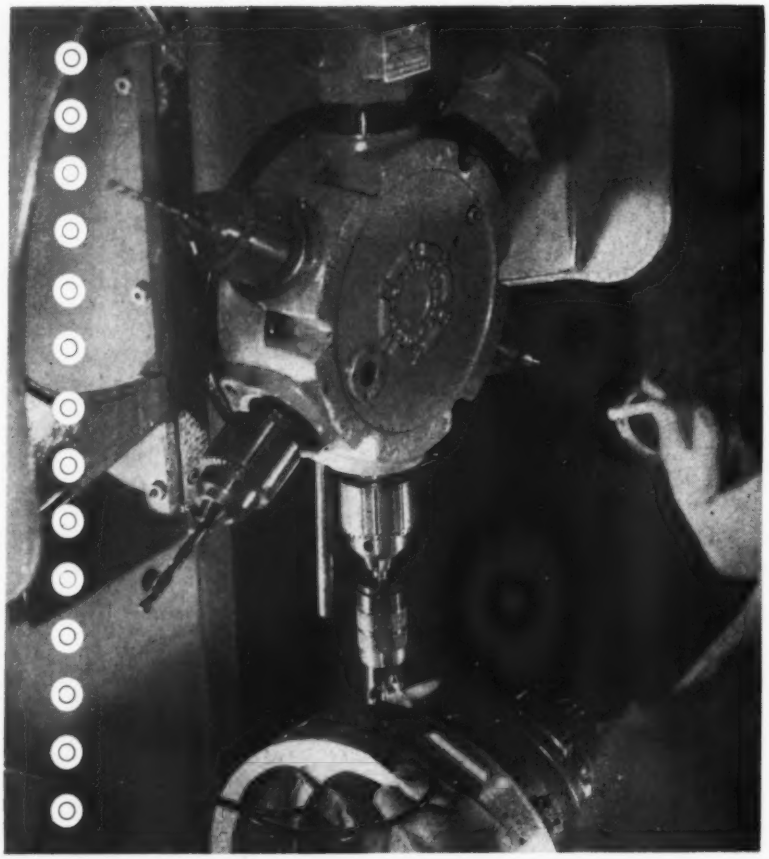

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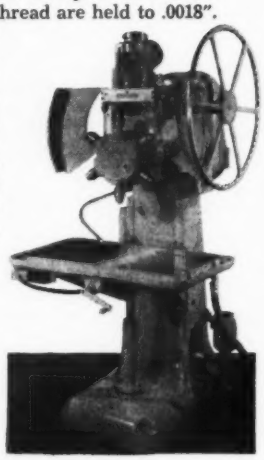
Give 45% Time Savings on

Missile Parts at Rheem Manufacturing Co.

Installation of ten 6-spindle Burgmaster POWER INDEXING Turret Drills with preselective spindle speeds and stops at Rheem's Aircraft Division has resulted in 45% time savings and has reduced rejects to less than 3%. Quality of the drilling, tapping and countersinking operations on missile and aircraft components of steel and aluminum has substantially improved. All operations are to close tolerances. The holes with Class 3 thread are held to .0018". Also, recentering is not necessary as tools are accurately centered, preventing bell mouthing. After each operation the next spindle automatically moves into position as the turret head indexes quickly by power from station to station. This permits a number of operations to be performed on a part without moving it from one machine to another, with resultant decrease in machining time.



Write Dept. TP-10 for descriptive literature.

BURG TOOL
MANUFACTURING COMPANY, INC.
15001 S. Figueroa St., Gardena, Calif.
New York — Burgmaster Eastern Sales Division
15 West 44th Street
Chicago — Burgmaster Machinery Co.
5329 Lincoln Avenue

CIRCLE INFORM-A-GRAM KEY NO. 60

. . . Month's Talk, from page 50

sional tolerance. After a mahogany model has been sitting around for possibly six months there is no telling what size it is. In view of this, many people are considering plastic models, instead of the usual types. Again, perhaps you are making a part for a customer who is having a lot of assembly trouble and it is all blamed onto you. If you had a plastic gage, you could show that the part was just like the model he supplied and could perhaps settle the difficulty. * * *

Another tool that is seldom found in the high production stamping plant is the drilling fixture. However, all of us at one time or another have been faced with the problem of putting holes in steel panels of limited production that do not warrant the cost of a piercing die. A plastic drilling fixture can be made. "Of course," you say, "it can be made out of steel." One can be built out of plastic more quickly, and more easily and is easier to use. If you have faced any of those problems, perhaps plastic or the use of plastic tooling can solve some of them for you.

In recent years plastic models have been substituted for wood models where models were required by more than one fabricator, or in more than one location at the same time. For example, you may be kellering your draw punch on one side of the city, while the welding fabricator is making an assembly fixture on the other side. Both of you need the model.

Recognizing this fact, the use of plastics in duplicate models has come into being. The reason for using plastics rather than building another mahogany model is perhaps obvious. Costwise, the plastic duplicate will run about a third of the cost of a mahogany model for the first duplicate. If you want more than one duplicate, your succeeding one runs about a sixth of the cost of the mahogany duplicate.

Aside from the economic factor you have the more important point that the duplicates will be exact reproductions. If any of you have seen plastics taken off a wood model, you were undoubtedly amazed at the infinite detail that is picked up in the case of hole locations or inch

. . . Continued on page 126

THE WALES WAY

SEE IT IN ACTION AT THE WALES EXHIBIT

▶ Come and actually operate this new WALES Fabricator yourself...see why tooling and production men responsible for producing quality products on schedule, at less cost, use THE WALES WAY to save days and dollars.

Put your punching, notching and nibbling problems up to the men of WALES. They are specialists in tooling and production. Bring your sketches or actual parts, WALES men will be on the spot to show you how to do it THE WALES WAY.

If you miss the Metal Show, write for complete details on THE WALES WAY to cut costs.

AT BOOTH 1210
METAL SHOW
OCT. 17-21

Specialists in Punching and Notching Equipment

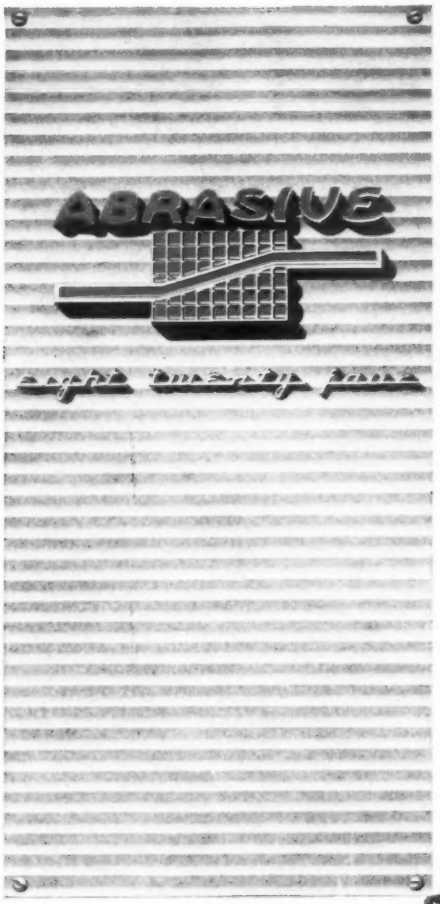
WALES-STRIPPIT CORPORATION

George F. Wales, Chairman

Payne Avenue, North Tonawanda, N. Y.

(Between Buffalo and Niagara Falls)

WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONTARIO



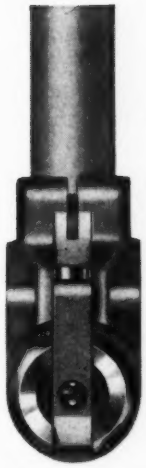
You are going to see new things from ABRASIVE

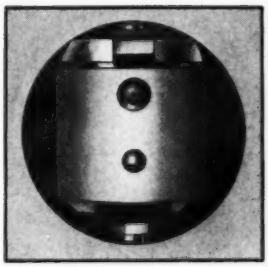
The new Abrasive name plate above gives you a hint! In 1956, our fortieth anniversary, Abrasive will introduce a number of important developments in their well known line of surface grinders. For your greatest production year, keep your eye on Abrasive pioneering in 1956.

ABRASIVE
Machine Tool Company
Dexter Road, East Providence, Rhode Island

Sorry! We can't show this revolutionary new Abrasive in detail. Look for it in 1956.

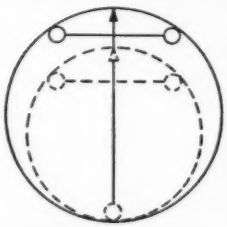
CIRCLE INFORM-A-GRAM KEY NO. 62

This  is IT



The New DIAL INDICATOR BORE GAGE

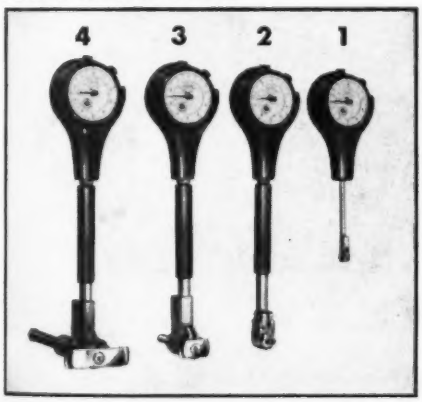
FOOLPROOF CENTRALIZATION



Centralizer places contacts on true diameter of hole.

- *Meets the great majority of all hole inspection needs.*
- *Longer gaging range.*
- *Four gages inspect all diameters from ½" to 8".*
- *Accuracy protected from handling temperature.*

Model 1250P-Series



These new Gages definitely meet the accuracy requirements of nearly all hole diameter inspections . . . and at a cost considerably less than that of more elaborate gaging equipment.

They are designed to give accurate centralization for setup with gage blocks, micrometers, master rings, or other suitable device.

Write for complete details of the Model 1250P-Series Bore Gage to —

FEDERAL PRODUCTS CORPORATION
Dept. 9G **Providence 1, Rhode Island**

Ask **FEDERAL**

FOR MODERN GAGES AND GAGING TECHNIQUES . . .

Dial Indicating, Air, Electric, or Electronic—for Inspecting, Measuring, or Automation Gaging

CIRCLE INFORM-A-GRAM KEY NO. 63

Zagar Gearless Drill Heads

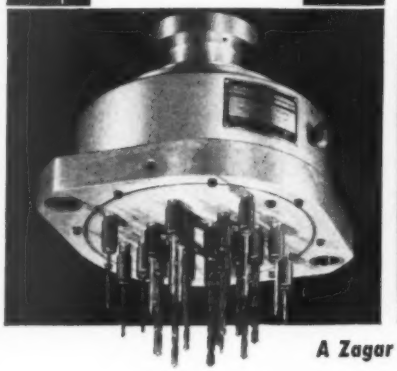
put 4 big advantages to work for you

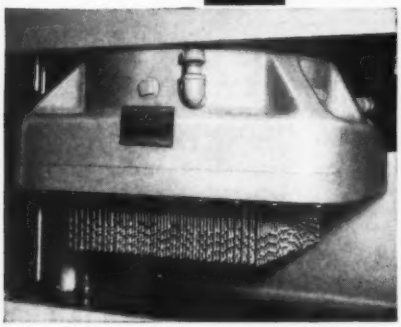
Any number of holes

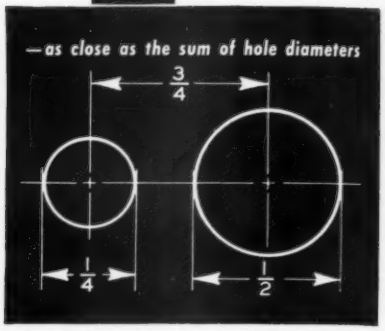
Any hole pattern

Any material

On all centers





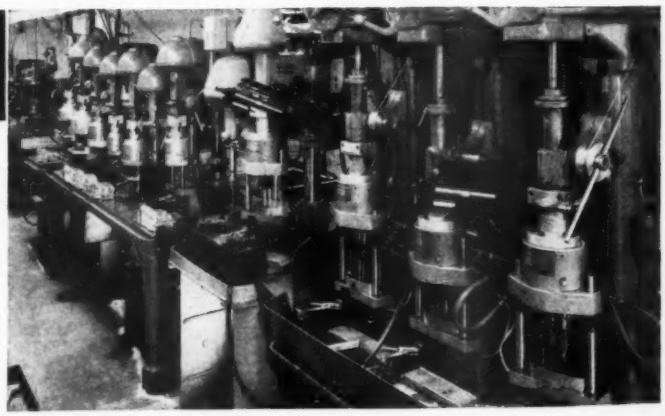


A Zagar drill head is never obsolete. Zagar can re-locate spindles for other hole patterns.

Can you visualize the savings made possible by drilling up to 1000 holes at one pass? Zagar standard practice can handle any machinable material up to 1½" diameter. Holes of varying diameters can be drilled to form any pattern. Zagar Gearless Drill Heads, their efficiency proven by many years' success, can be installed on existing drill presses. Or, Zagar will lay out the necessary tooling for your entire job. May we see your sample parts and study your requirements? There is only one *right* answer—one *best* answer—for those requirements. May we supply it?

Let **ZAGAR** tooling plan the complete job for you

Whether your runs are long or short, let Zagar engineering survey your needs with a view to saving you the cost of special machines. In the case at the right two lines of *standardized* self-clamping drill jigs ream, tap and drill an aluminum die casting, both valve body and cover. The problem of limited production was readily solved. What, sir, are your requirements?

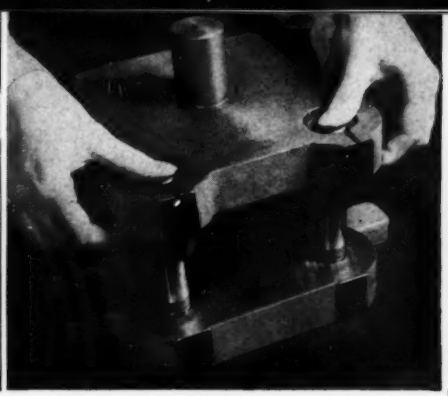


ZAGAR TOOL, INC. 24000 LAKELAND BOULEVARD, CLEVELAND 23, OHIO

Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

Write for Technical Data Sheets "T-10" for more information.

CIRCLE INFORM-A-GRAM KEY NO. 64



Here's a real test for quality...if you can make the punch holder glide up the pins just by squeezing—and hold its position without sinking back—it shows that the fit between pins and bushings is well-nigh perfect. The "finger-tip" action is typical of all DIECO die sets small enough to squeeze this way...and the larger ones are just as perfectly fitted.

What does "quality" in a die set mean to you?

If it means a perfect fit between pins and bushings...shoes that are absolutely parallel and stay parallel under load...*all* parts finished to precise tolerances with such unfailing regularity that there is never any variation in accuracy and serviceability among different die sets from the same source...then it stands to reason you must already be a user of DIECO die sets.

- Hardened steel pins superfinished and individually gaged to 0.0002" tolerance.
- High-tensile steel shoes, stress relieved and precision machined.
- Choice of bronze-plated bushings on hardened steel backing or hardened steel bushings—all with grease fittings. Precision ground and micro-honed to less than a "tenth" tolerance; can be arranged for pressure lubrication.
- Welded or screw shanks; any length guide pin.
- 1728 combinations in steel or semi-steel; interchangeable parts speed delivery.

E. W. BLISS COMPANY

BLISS
SINCE 1857

DIE SUPPLY DIVISION

DIECO

1400 Brookpark Road, Cleveland, Ohio

Industry's most complete line of die sets and die makers supplies

DIE SETS • GUIDE PINS • BUSHINGS • SPRINGS
SOCKET HEAD SCREWS • 5001 ITEMS

DIE SUPPLY PLANTS AND OFFICES

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311 Vermont Ave.
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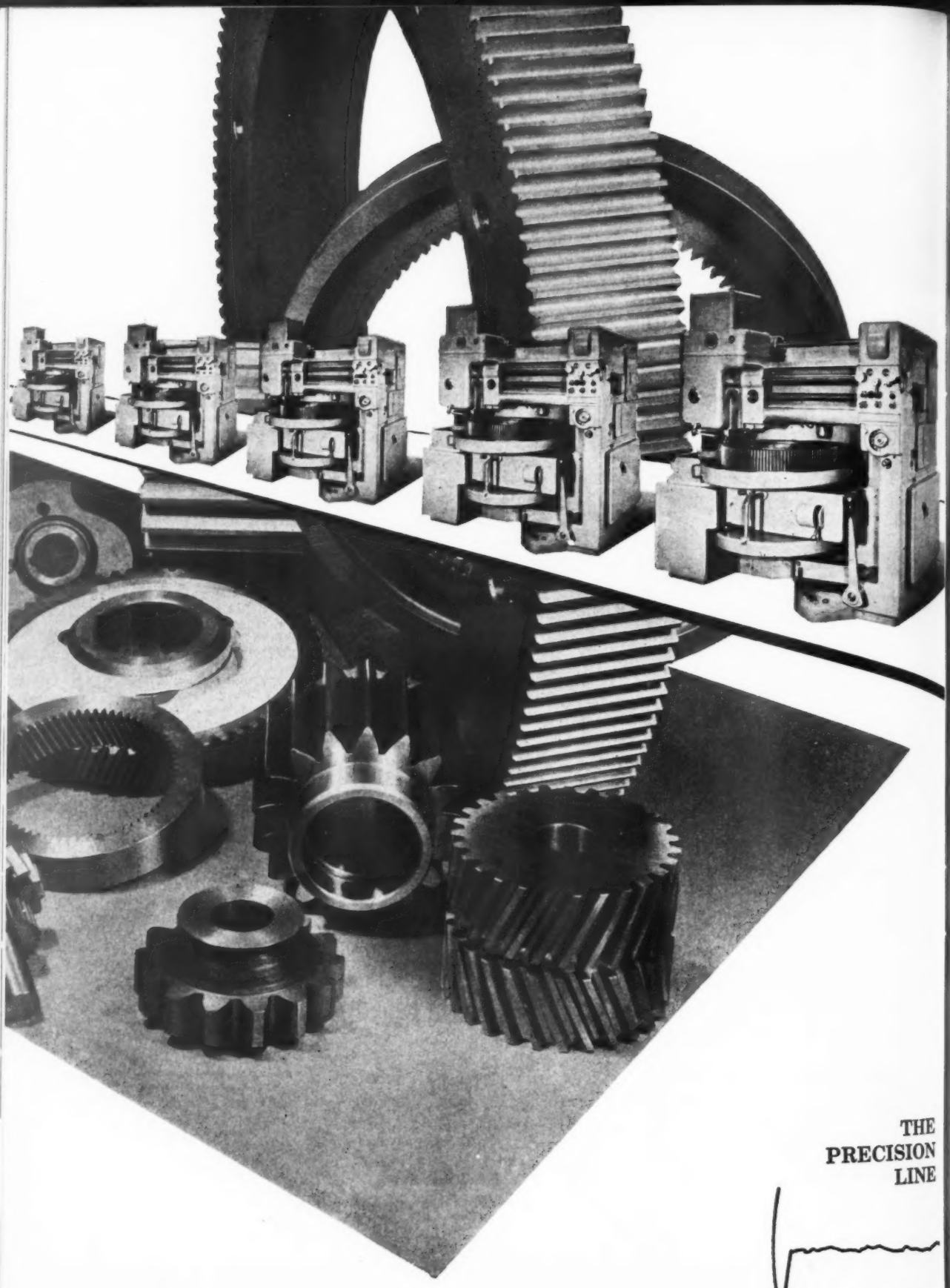
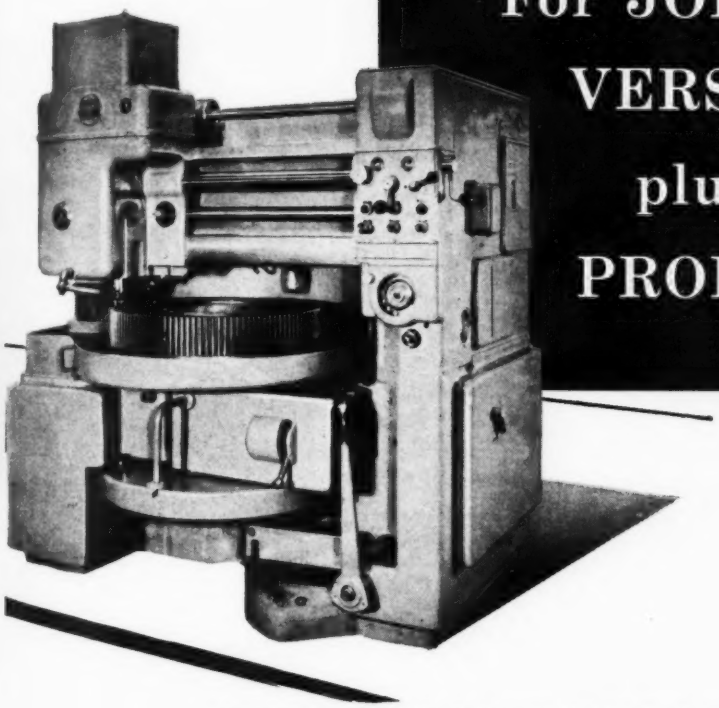


THE
PRECISION
LINE

For JOBBING VERSATILITY plus HIGH PRODUCTION



HERE'S versatility that pays dividends. For the Fellows 36-Type Gear Shaper has real "earning power"... whether used to handle virtually every job that comes up in a small gear department... or concentrated upon the heavy work in a large production shop.

A powerful, ruggedly constructed, heavy duty machine, the 36-Type can take extra heavy cuts at high speed... yet hold close limits. Low set-up time, fast gear-shift change from heavy to fine feed, quick dial adjustment from one cutter-spindle speed to another... these are just a few of the ways the 36-Type keeps down costs.

Ask your Fellows Representative to explain *all* the profit-making advantages built into the 36-Type... as well as the Fellows Plan for deferred payment. Write, wire or phone any Fellows Office!

THE FELLOWS GEAR SHAPER CO., Head Office and Export Dept., 78 River St., Springfield, Vermont
Branch Offices: 319 Fisher Building, Detroit 2 • 5835 West North Avenue, Chicago 39
2206 Empire State Building, New York 1 • 6214 West Manchester Avenue, Los Angeles 45

Fellows *Gear Production Equipment*

CIRCLE INFORM-A-GRAM KEY NO. 67

at no extra cost to you . . .

NEW Quality Features on All AIR and HYDRAULIC CYLINDERS

Miller

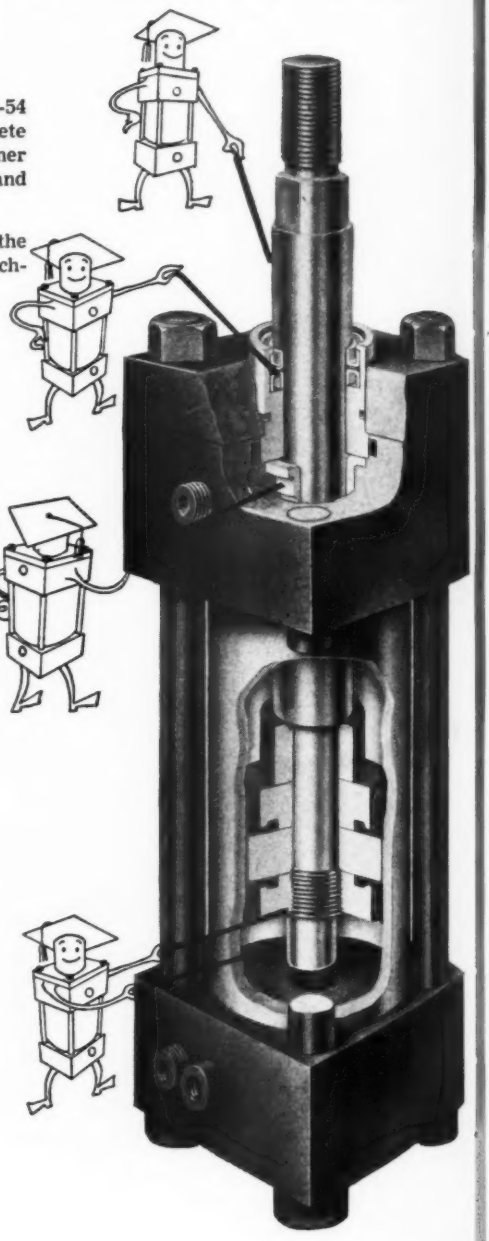
CASE HARDENED CHROME PLATED PISTON RODS

On all Miller Air and Hydraulic Cylinders

Benefits To You

CASE-HARDENED Piston Rods (52-54 Rockwell "C") provide practically complete protection against damage from hammer blows, wrench-dropping, mishandling, and similar occurrences.

The HARD CHROME PLATING over the case-hardened rods protects against scratch-damage and rust.



"TEFLON" WIPERS

On all Miller Air and Hydraulic Cylinders

"TEFLON" HYDRAULIC ROD SEALS

On all Miller Hydraulic Cylinders only

Benefits To You

"TEFLON" Rod Wipers and "TEFLON" Hydraulic Seals withstand temperatures from —100° F. up to 500° F. They are impervious to practically all known chemicals, including the fire-resistant, special, and standard hydraulic fluids in current use.

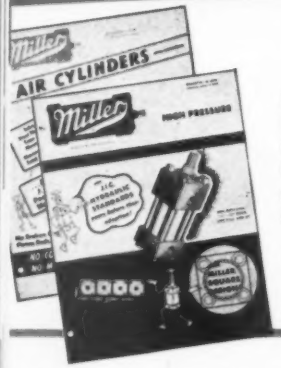
RUST RESISTANT SURFACES

On all Miller Air and Hydraulic Cylinders

Benefits To You

Highest quality Black Ferric Oxide Finish provides rust protection in air cylinder operation and on all cylinders during shipping and installation.

Cylinder heads, caps, mountings, pistons, followers, and the unplated portions of the piston rods have this finish. It is not recommended for water service.



WRITE FOR CYLINDER BULLETINS H-104 and A-105

Complete Miller cylinder line includes: air cylinders, 1½" to 20" bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.

Over 8,000 Different Cylinder Selections Available for Immediate Delivery. Write for Complete List.

EFFECTIVE DATES

These new Miller features will be provided at no extra cost after January 1, 1956—and at Miller's option prior to that date.

SALES AND SERVICE FROM COAST TO COAST

CLEVELAND • YOUNGSTOWN • DAYTON • TOLEDO • CINCINNATI • COLUMBUS
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TORONTO, CANADA and OTHER AREAS

Miller

MILLER FLUID POWER CO.

2046 N. Hawthorne Ave. • Melrose Park, Ill.

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS

Four More Miller Firsts . . .

Our "Report To Cylinder Users" was a simple statement of Miller Fluid Power Company's policy. In it was mentioned our dedication to the constant improvement of our products.

In line with this policy, here are new quality cylinder features that will eliminate many of the problems which you have reported to us.

Miller gave cylinder users one of its firsts when we chrome-plated all cylinder piston rods. Our reason was obvious. Chrome-plating gave every rod a mirror-like finish that no corrosive or abrasive dust could scratch. Miller made this chrome-plated, longer lasting rod standard. AT NO EXTRA COST.

Preventing Damage To Piston Rods

There were still plenty of hazards to which piston rods were subjected. A careless workman with a too handy wrench or pair of pliers meant a scored piston rod. A falling object striking the rod dented the softer metal beneath the plating of chrome. A jolt during assembly left its trouble-breeding mark. All of these nicked and scored the piston rods, damaging the whole assembly. Little could be done about this beyond repair and replacement—until the Miller announcement that from now on the piston rods on all cylinders—air and hydraulic—will be specially hardened (52-55 Rockwell C) to foil the carelessly used tool, the accident in transit or assembly, the falling object or unnoticed knock. Naturally, the new hardened rods will still be chrome-plated. Miller will now make this super quality an everyday standard. AT NO EXTRA COST.

Meeting The Challenge Of The New Demands On Seals

Rod seals on Miller hydraulic cylinders were constructed to be leakproof under all ordinary operating conditions. We guaranteed this. But we also stated in all our catalogues that for special conditions there must be special rod seals at an extra cost. Rod seals to withstand high temperatures had to be specially constructed. Where fire resistant fluids were used, special rod seals had to be provided at an extra cost. Because many fire resistant fluids destroy ordinary packing.

The present widespread use of these fluids and excessive heat generation from high speed operation and increased loads have resulted in reports of trouble on cylinders where ordinary seals were subjected to these hazards. These reports were not received with joy at Miller, even when the fault was definitely not ours. We don't like to have trouble develop on any Miller installation under any condition. So we decided to do something about these problems of the rod seals.

A new expensive material known as "TEFLON" has been developed for use as seals. This material is impervious to temperatures from —100° to plus 500° F. It resists all known fluids, even the most destructive of the fire resistant fluids. Now, every piston rod on every Miller hydraulic cylinder will be fitted with "TEFLON" Piston Rod Seals. AT NO EXTRA COST.

In addition, all rod wiper seals on all Miller Air and Hydraulic cylinders will be of the same chemical-and-heat resisting Teflon material.

These Teflon rod wiper seals will be standard on every Miller cylinder, regardless of how and where it will be used. This is Miller's way of doubly insuring cylinder users against all possible hazards. AT NO EXTRA COST.

Protection Against Rust

The barrels of Miller air cylinders are of moisture-resistant brass. The barrels of hydraulic cylinders, since they run in oil, are protected once they are installed and in operation. Beyond this all cylinder parts are subject to rust and corrosion. Such exposed parts as heads, caps and tie rods quickly show the unsightly evidences of rust. At least this has been so up till now. But all this is now being corrected.

From now on Miller will protect all these parts on both air and hydraulic cylinders with a black oxide process in which a chemically created ferric oxide coating is developed on the surface of the metal to protect against rust and other corrosion. Every Miller cylinder sold will carry this added protection. AT NO EXTRA COST.

These four new Miller firsts are added to the many firsts established by Miller. Like other Miller firsts which created new departures in cylinder design and construction, these are now offered as Miller standard specifications. AT NO EXTRA COST.

MILLER FLUID POWER COMPANY
2046 N. Hawthorne Avenue
Melrose Park Illinois

CIRCLE INFORM-A-GRAM KEY NO. 69

Use postage-free Inform-A-Gram Key Number Card for your request

"Tool Steels for the Non-Metallurgist" presents a practical understanding of tool steels without being overly technical. Properties of the six basic classifications are discussed and recommendations made as to which application is most suitable for each. Air hardening, hot working, high speed, oil hardening, shock resisting, and water hardening steels are covered in the 44-page book. Included are tables of length, temperature, and hardness conversions; and fraction and decimal equivalents. One section is devoted to discussing heat treatment. Crucible Steel Company of America, P. O. Box 88, Pittsburgh 30, will supply copies, or **Circle Inform-A-Gram No. C1.**

The Proximity Meter Capacitance Gauge that measures without touching the specimen is described in a new manual released by Fielden Instrument. The instrument can detect a 0.001° C temperature change and variations as minute as 0.000001". The manual's aimed at helping industry and research find solutions to precision measurement problems. It covers applications of the meter as a non-contacting micrometer; concentricity, pressure, surface finish, and strain gauges; torque meter; micro thermometer; etc. Copies of the TM-951-1 technical and application manual are supplied by Fielden Instrument Div'n, Robertshaw-Fulton Controls Co., 2920 N. 4th St., Philadelphia 33, or — **Circle No. C2.**

The "Handy Data File" for socket screw products has been issued by Mac-It Screw Div'n. It contains complete information on hollow pipe plugs; stripper bolts; and hollow lock, button head socket cap, flat head socket cap, socket head cap, and hollow set screws. It also covers "Mac-it" hex-socket keys. The pin-up, easy-to-read file gives dimensional standards, standard sizes, physical properties, and recommended tightening torque. Mac-it Screw Div'n, Strong, Carlisle & Hammond Co., 1392 W. 3rd St., Cleveland 13, or **Circle Inform-A-Gram No. C3.**

"Torque Manual" depicts the general principles of torque tools and methods of use. It contains detailed drawings and explanations of the tools, laws, and formulas. A torque specification chart for mild steel bolts is found on the back page. P. A. Sturtevant Co., Addison, Ill., or — **Circle Inform-A-Gram No. C4.**

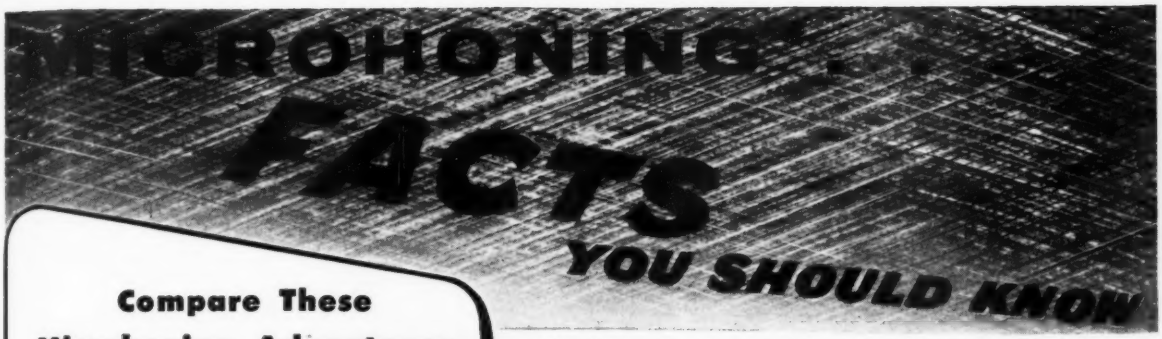
High Temperature Applications of Molybdenum are presented in terms of today's uses and those of the near future. The technical and fabricating data on arc-cast molybdenum and its alloys is given in a 72-page book from Climax Molybdenum Co. Among the things covered are physical and mechanical properties, resistance to corrosion, fabrication of parts, and methods of production and source of supply. Graphs, charts, and weight tables are also included. The manual, "Arc-Cast Molybdenum and Its Alloys", is supplied by Climax Molybdenum Co., 500 Fifth Ave., New York 36, or — **Circle Inform-A-Gram No. C5.**

How To Produce Aluminum Parts on automatic screw machines is discussed in a 52-page book from Kaiser Aluminum. Technical data is given on the types of machines and cutting fluids. Illustrations show proper tool angles for machining various aluminum alloys. Tables cover speeds and feeds for cutting, skiving, drilling, recessing, threading, turret knurling, etc. General formulas and a nomograph for determining the number of parts and weight per 1,000 obtainable from a given size of stock are also presented. Kaiser Aluminum & Chemical Sales, Inc., 228 N. LaSalle St., Chicago 1, or **Circle Inform-A-Gram No. C6.**

Basic Considerations in Designing Precision Springs are discussed and illustrated in an eight-page engineering study published by Hunter Spring Co., Lansdale, Pa. Line drawings, graphs, and formulas describe the types of springs and design criteria, and load-deflection characteristics. It also presents eight ways to specify compression and extension springs and six ways for simple, close-wound torsion springs. **Circle Inform-A-Gram No. C7.**

Over 500 Jig and Fixture Components are featured in a catalog from Standard Parts. It shows how to maintain the highest standards of quality at the lowest possible cost when tooling for competition. The catalog also includes designated sheets which can be used as tracing templates. Standard Parts Co., 1000 Broadway, Bedford, O., or — **No. C8.**

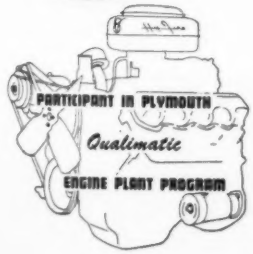
"Fabrication of Stainless Steels" covers the composition and characteristics of austenitic, ferritic, and martensitic steels. One section discusses welding, riveting, soldering, and joint design, and another is devoted to machining, cutting, forming, and annealing. Weights and gauge data is given for sheets, strip, plates, angles, and bars. The manual may be obtained by writing direct to United States Steel Corp., Room 4922, 525 William Penn Pl., Pittsburgh 30.



Compare These Microhoning Advantages

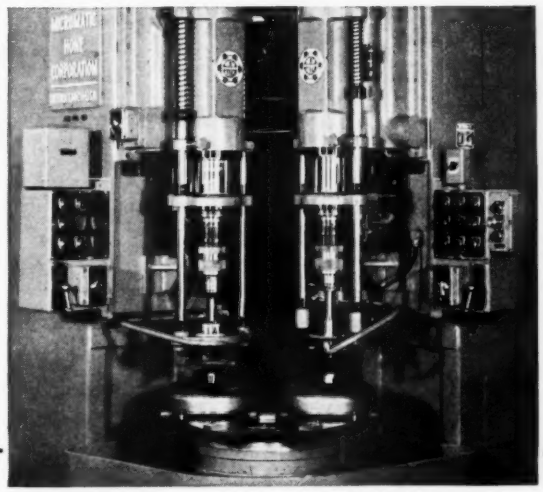
- Rapid and efficient stock removal.
- Dimensional accuracy obtained in every part.
- Macrogeometric accuracy—the Microhoning action is not affected by vibration; long abrasive stones generate a true surface.
- Microgeometric accuracy—any desired surface finish and cross-hatch angle duplicated in every part.
- No concentration of heat—the structural surface of the part is undamaged.
- Microhoning applications include tapers, spheres, splines, tandem or interrupted bores, flat surfaces, and any type of material, regardless of hardness (or softness).
- No practical limitation on part length and diameter.
- No chip removal problem—the minute Microhoning chips are flushed away in the coolant and automatically removed.
- Automatic size control.
- Readily adapted to automation.
- Eliminates tool dressing time and cost.
- Location of bores is undisturbed.
- Float principle and low speeds assure minimum maintenance.
- Backed by over 26 years of engineering and service experience.

PRECISION PRODUCTION THROUGH MICROHONING
MICRO MATIC



Microhoning is a low-velocity abrading process that employs thousands of small cutting tips. Because simultaneous and continuous cutting action of tips is spread over a wide area, stock is rapidly removed with a minimum of heating. This abrading technique generates functional surfaces ***by obtaining in one operation the required tolerances, specifications, or condition*** of the surface characteristics.

Included in these characteristics are: dimensional size (the distance between points or faces of a part, e.g., the diameter of a bore); macrogeometry (waves whose crests are more than 1/32" apart); microgeometry (roughness or scratches whose crests are less than 1/32" apart); and surface structure.



Microhoning . . . Example Application

Microhoning both I.D. and O.D. of the hub of a transmission torus cover to generate geometric accuracy and a surface finish of 10 microinches.

O.D.—*2.375", approx. 1" long, blind end*
I.D. —*2.125" x .280" long*
58-60 Rockwell "C"
Stock removal: *.001" to .002"*
Surface finish: *10 microinches*
Production: *180 per hour, gross.*

***MICROHONING = Stock Removal + Geometry + Size Control + Surface Finish**

Movies describing various machining processes and the generation of functional surfaces are available for group meetings. For literature or further information on films, write to:

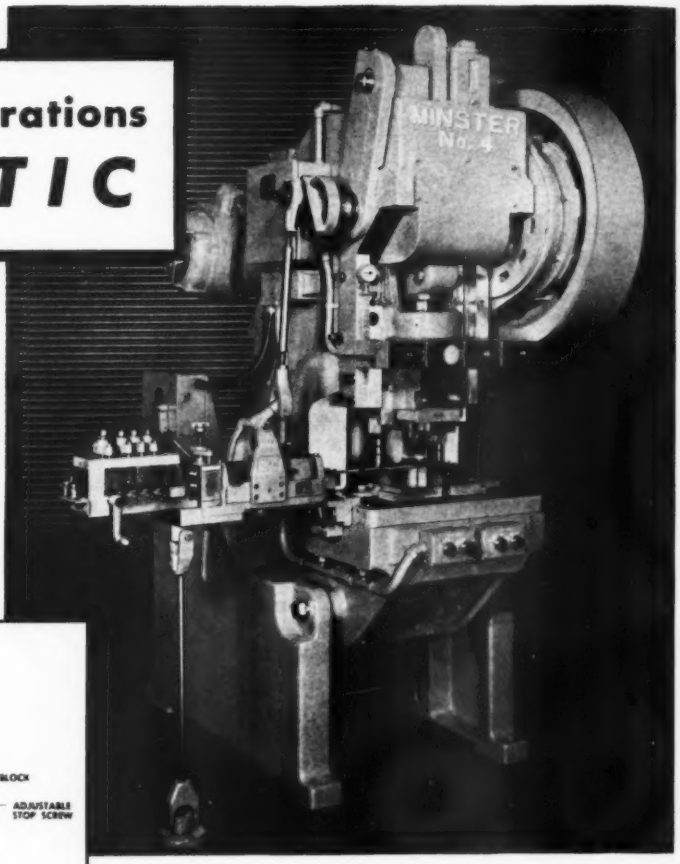
MICROMATIC HONE CORPORATION

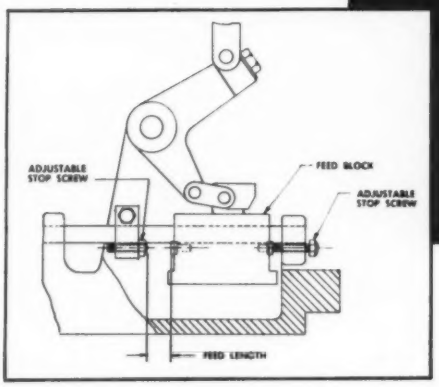
8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 71

Make Your Press Operations AUTOMATIC

The photo at the right shows an SF-1 U. S. Slide Feed with SS-07 U. S. Plain Stock Straightener (7-roll type) mounted on a No. 4 Minster Press which is equipped with an air clutch and variable speed drive.





The drawing at the left shows how feed length is controlled between positive adjustable stops on the U. S. Slide Feed. This feature assures controlled accuracy of feed length — an especially important factor in progressive die operations.

Cost reduction is of the utmost importance to you. One means of achieving this is through automatic operation. U. S. Slide Feeds are designed and built primarily for the automatic feeding of coil stock into punch presses. By using a U. S. Slide Feed with a Straightener and a Stock Reel or Coil Cradle you can convert your presses into automatic machines.

The use of this equipment gives you the double advantage of increased production and reduced labor costs, plus the feature of flexibility. Within their capacity, U. S. Slide Feeds can be easily adapted to handle materials varying in width, thickness and length of feed. Furthermore, U. S. Slide Feeds are designed so that the length of feed is controlled between positive stops as shown in the drawing, providing consistent accuracy that is especially desirable in progressive die operations.

We are sure that you want to reduce costs and speed output in your press operations. We suggest that you investigate the many advantages of U. S. Automatic Press Room Equipment. Bulletin 80-P gives complete specifications. Ask for your copy.

U. S. TOOL COMPANY, Inc.

Ampere (East Orange) New Jersey

Builders of U. S. Multi-Slides — U. S. Multi-Millers

U. S. Automatic Press Room Equipment — U. S. Die Sets and Accessories

CIRCLE INFORM-A-GRAM KEY NO. 72

announcing A NEW

NEW BRITAIN +GF+ COPYING LATHE

designed for the highest production jobs in the worl

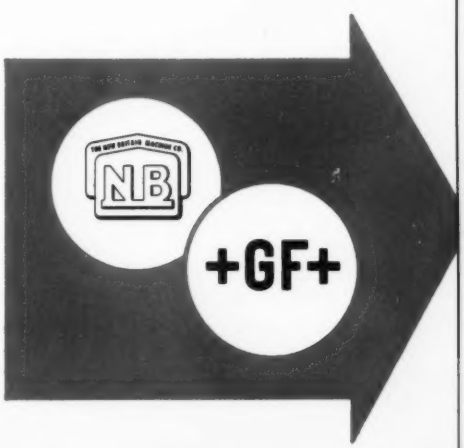
THE New Britain **+GF+** Copying Lathe was originally designed as a highly versatile quickly-tooled machine, which is available in eight different models, and is an outstanding profit maker on both short and long runs.

Now New Britain has added two new models, the $1\frac{1}{28}$ and $1\frac{1}{40}$ which successfully apply the basic principles of this new approach to copy turning, to the highest production applications in metalworking history. One of these new machines, a typical work piece and diagrams of the operations performed, are shown on the two following pages.

If you have work that requires contour turning and facing, the New Britain **+GF+** has basic profit-making advantages. You should know about them, regardless of whether your needs call for small lots, or automated long-run production.

A NEW APPROACH TO COPY TURNING is the title of a new color motion picture which is available for showing in your plant. Ask your New Britain Representative, or write The New Britain Machine Company, New Britain, Connecticut.

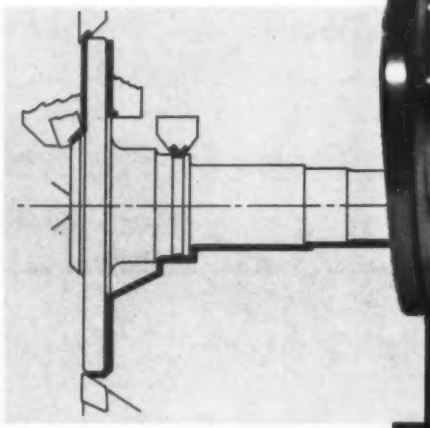
(See the following two pages for more details)



New High-production New Britain +GF+

. . . continued from preceding page

a new approach to important savings



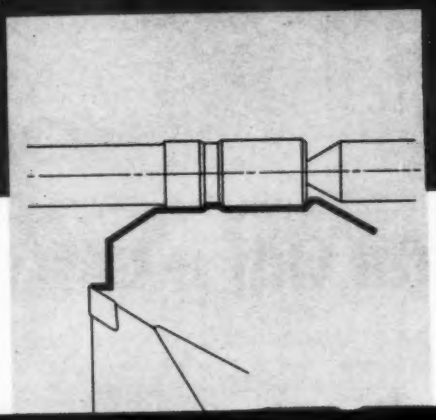
FOR the typical rear axle shaft illustrated, a double carriage design plus infeed attachment permits machining both ends at once, eliminating wasteful idle time.

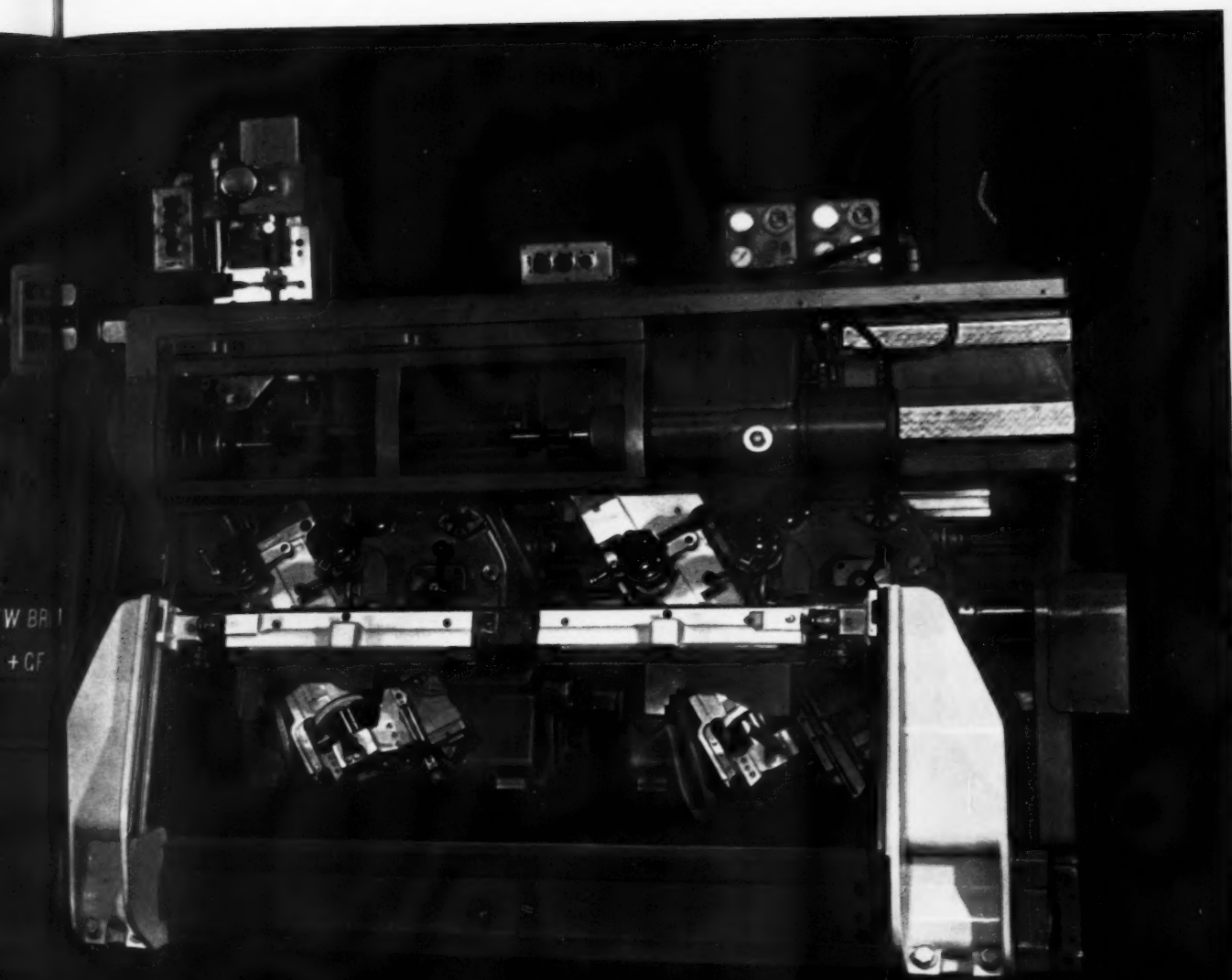
This new copying lathe features pick-off change gear headstock, combined with a selector lever for high and low spindle speed range. Its basic advantages of template control, easy chip removal and elimination of expensive form tools are readily adaptable to a wide variety of work which ordinarily would require many more tools, and, in some cases, further operations on additional machines. Get the facts from your New Britain Sales Representative or write the factory.

The NEW BRITAIN MACHINE COMPANY

Copying Lathe . . .

on your "expensive" pieces





New Britain-Gridley Machine Division, New Britain, Connecticut • Lucas Machine Division, Cleveland 6, Ohio

• AUTOMATIC BAR and CHUCKING MACHINES • PRECISION BORING MACHINES
• LUCAS HORIZONTAL BORING, DRILLING and MILLING MACHINES • NEW BRITAIN "45" COPYING LATHES

Which will it be—?

Price

Cost

As you well know, *price* of new equipment is only the beginning. Actual production savings determine real equipment *cost.*

From this realistic *cost* standpoint you can't beat Erickson collet chucks. Here's why:

Guaranteed accuracy of .0005" and superior gripping power of Erickson collet chucks assure proper drill alignment. Drills then cut evenly on both cutting lips permitting faster machine feeds and proper speeds . . . give more holes per grind.

What's more, ease of operation greatly reduces set-up time and since Erickson chucks can grip on the flutes, you can stub your drills . . . extend tool life . . . maintain accuracy.

Send for new Catalog K today! It gives the complete Erickson story. You'll find many interesting applications for all Erickson holding tools.

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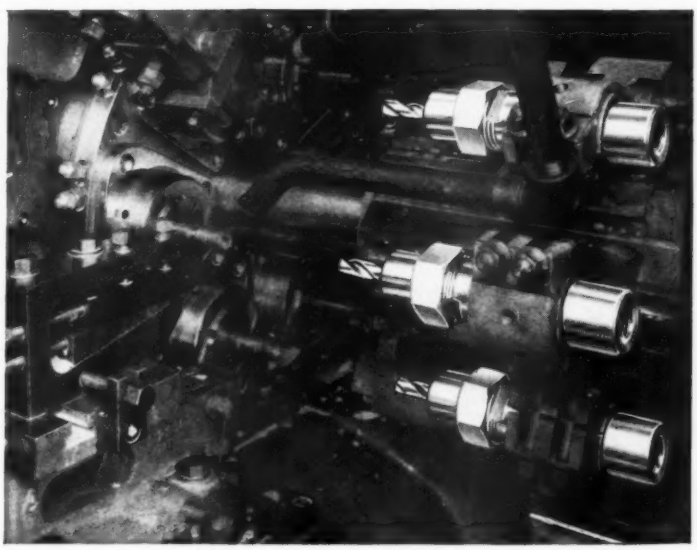

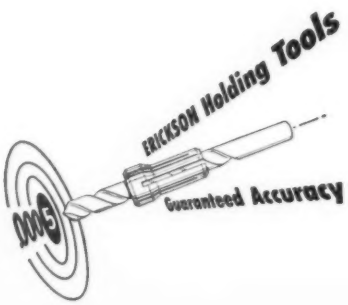

COLLET CHUCKS • FLOATING HOLDERS
TAP CHUCKS • TAP HOLDERS • AIR-OPERATED
CHUCKS • EXPANDING MANDRELS • SPECIAL HOLDING FIXTURES

CIRCLE INFORM-A-GRAM KEY NO. 75

a heritage from Walter P. Chrysler

In 1908 a Chicago Great Western Railroad master mechanic, just promoted to superintendent of motive power, attended the Chicago automobile show. That, for Walter P. Chrysler was the beginning of the end of a railroad career, during which he had earned a reputation as a mechanical genius way beyond his years, and was the first glimpse on a dim and distant horizon of an automobile bearing the Chrysler name.

Specifically, what precipitated his immediate actions was a touring car — ivory white, red upholstery, khaki top on varnished wood bows, polished brass lamps, and, far from least, a handsome tool box on the runningboard "that my fingers itched to open." First, last, and always, a mechanic.

For four days he drooled over that car — a Locomobile, no less — but the price tag held steady at $5000. He had $700 in savings and later said, "I must confess that I never stopped to ask myself if I should, if I could afford to go in hock to buy that car. All I asked myself was: Where could I raise the money?"

Forty-three hundred borrowed dollars later, the Locomobile arrived in Oelwein, Iowa, by railroad freight car and a teamster hauled it into the barn behind the Chrysler house. For weeks he cranked it to start the engine, tuned it, took it apart, put it back together, cranked it, tuned it, took it apart and put it together again, nights, Saturdays and Sundays. (After three months of this, Mrs. Chrysler intimated that it was about time they went for a ride!)

Such was Walter P. Chrysler's insatiable hunger for mechanical knowhow plus an extraordinary ability to put that mechanical knowhow to work, improving methods and products. All his life he had, in addition, that ability to attract people of like enthusiasms, similar mechanical aptitudes bordering on the genius, and of equally venturesome spirit.

Years later, when speaking of the accomplishments of such dedicated group efforts he said, "I really understand it best, I think, when I go out to Detroit and sit at a meeting of the dozen younger fellows who are running the business. I am a sort of grandsire there, the chairman of the board. I got my start in overalls; so did Keller, the corporation's president; so did Zeder; so did Hutchinson; so did Skelton; so did Breer; so did Mitchell; so did Byron Foy; and so did many of the others.

"We are, all of us who sit at that table, American workmen in the simple, exact meaning of the term. Those who come after us in the years ahead will be the same, and the reason for this is that there is no way for men to qualify themselves for what we do at that table except by work and learning."

And finally, "When all these minds, through organization, are made to function as a single intelligence, each member of which is a special gifted part, why, then you can expect to produce magic."

And so we come to a "second generation" imbued with the spirit and philosophy of Walter P. Chrysler, some of them so young that they cannot remember when there were no Chrysler cars on the highways.

This issue of TOOLING & PRODUCTION is a tribute to another dedicated group of Mr. Chrysler's "younger fellows", those who today head up the Plymouth Division, those who are so successfully following the tried and proved precepts established, during his lifetime, by one of the automobile industry's all-time master mechanics.

We salute Plymouth's John Mansfield, Carl Demrick, Lyle Blanchard, Ray McCarroll, Wes Embury, Bill Allen, Bob Anderson, Jack Ondrus and Jack Powell. They are today, "Those who come after us in the years ahead. . ."

The job they have done, with each member being "a special gifted part" and the entire group functioning "as a single intelligence", is the story of the new Plymouth Qualimatic V-8 engine plant told in the following pages.

Each has followed the precept of "work and learning," and as a group they were expected "to produce magic." That they have done so is an understatement. The magic they have worked is a true heritage from Walter P. Chrysler.

E. Willard Pennington

editor

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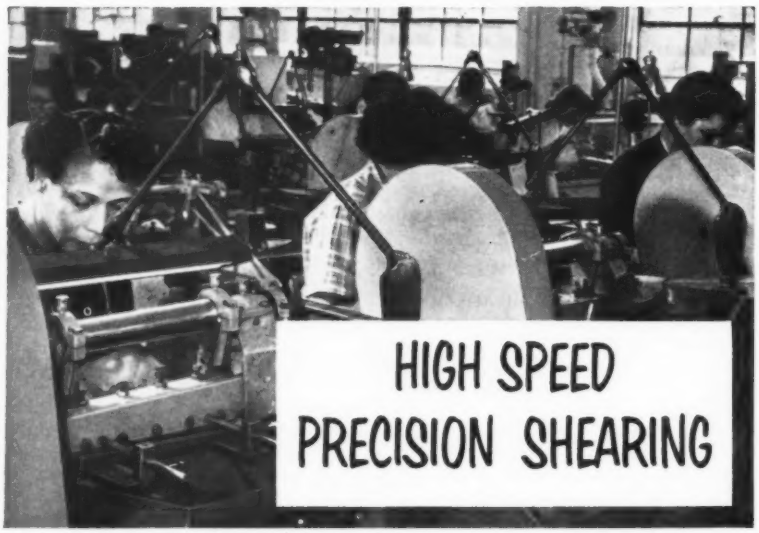
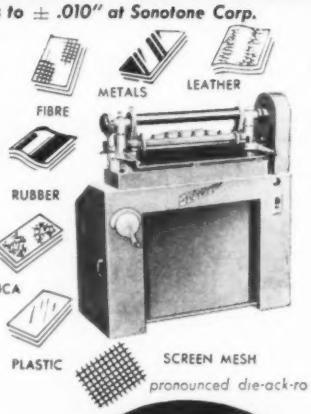


Production shearing of nickel sintered plates to ± .010" at Sonotone Corp.

DI-ACRO POWER SHEAR

COAST TO COAST FAVORITE FOR—

- **PRECISION**—strips less than .025" wide accurately sheared, parts exactly duplicated.
- **CUTTING SPEED**—from 30 to 200 strokes per min. Continuous and single stroke operation.
- **CAPACITY**—16 gauge sheet steel.
- **SIMPLICITY**—no experience needed to operate.
- **RUGGED CONSTRUCTION**—backed by warranty.
- **SELECTION**—four models, immediate delivery.
- **ECONOMY**—price and operating costs are rock bottom.
- **ENGINEERING SERVICE**—always at your disposal.



pronounced die-ack-ro

SEND FOR SHEAR MANUAL
Sixteen pages of helpful information to aid you in selection of machines for your shearing operations. It's free—write today.

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CIRCLE INFORM-A-GRAM KEY NO. 78

Featuring:

THE PLYMOUTH QUALIMATIC V-8 ENGINE PLANT

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Tool Grinders

EX-CELL-O

EX-CELL-O for PRECISION

FOR CARBIDES—
CAST ALLOYS—
HIGH-SPEED STEELS

Ex-Cell-O's complete line of tool grinders sharpen single-point tools efficiently and economically. All are double-end models. All use cup-type wheels and have large easy-to-adjust tool rest tables.

There's an Ex-Cell-O Grinder to suit the needs of every shop, large or small. For data on Ex-Cell-O's complete Tool Grinder line, write to Detroit, or call your local Ex-Cell-O representative.

Style 44-A Ex-Cell-O Precision Carbide Tool Grinder is one of the newest models. With inbuilt motor precision spindles, and ample coolant pressure flow, it does fast work on a wide range of tool sizes.

EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN

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MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

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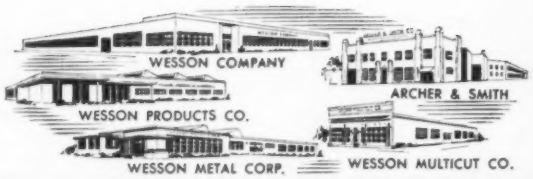


carbide NEWS

26 Outperforms Other Carbides 8:1

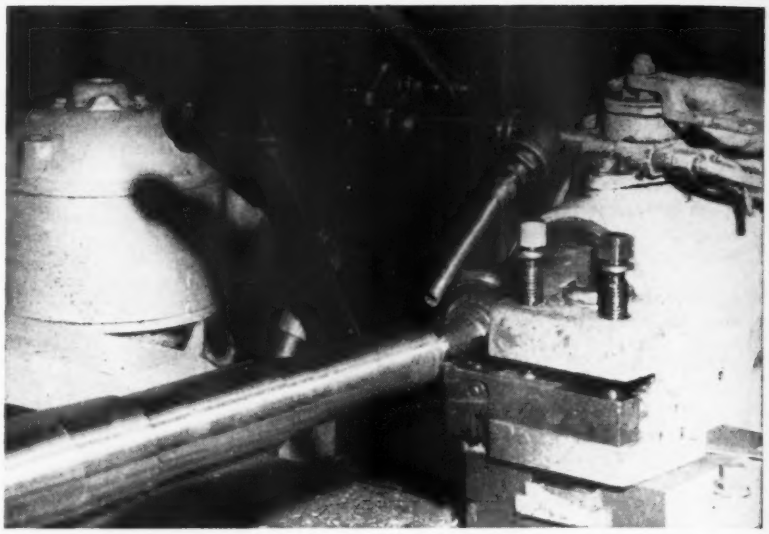
Boosts sprocket shaft output from 15 to 120 pieces per grind

In a series of production comparison tests, Grade 26 again came out on top—this time in machining forged steel (Rockwell 44) tractor sprocket shafts at a large midwestern tractor company.

With Wessonmetal 26, output averaged 120 pieces per grind as compared with 15 pieces per grind for all other steel cutting grades tested.

The operation is performed on a new 20" Monarch Air Gage Tracer lathe and consists of finish turning the shaft diameter, forming radii and chamfers, and rough turning all other diameters. Length of travel in the cut is 18¼"; speed 375 sfpm; feed range from .009 to .012". Average depth of cut for all diameters is ¼-inch.

Primary reason for the big increase in life achieved with Wessonmetal 26 is its ability to stand up under widely varying conditions. Inserts made of other carbides shattered or broke after 12 to 15 pieces on one cutting edge and could not be indexed. This trouble was eliminated with Grade 26, which averaged 20 pieces per edge and could be indexed to give a total of 120 pieces per grind.



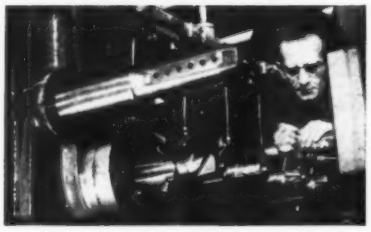
Worthy of note also is that the performance of Wessonmetal 26 (a "nearly universal" steel cutting grade) was achieved in comparison even with carbides of a specialized nature specifically selected for this operation.

New Film Points Way To Better Tooling

One of the most dramatic technical sound films yet produced is now released by the Wesson Company for showings to technical and shop groups.

Built around the development of tooling for an actual job—the machining of tractor track links—the 16 mm. technicolor sound film—which took two years to complete—records the *failures* as well as the successes achieved. The trials and tribulations encountered will remind many of their own experiences.

Entitled "Tools of Abundance," the film tells how a large manufacturing committee working with Wesson tool engineers carried a specific job through to completion. It is the story of how cooperation helps to develop and improve American manufacturing methods.



This story of teamwork—supplemented by about a dozen other general machining and high production operations in the film—provides a rational approach to solving other difficult tooling problems. For a showing to YOUR company, write for the film on your company letterhead. A Wesson man will bring it to you.

tools Wesson carbide Wessonmetal

WESSON COMPANY
DEPT. AD
1220 Woodward Heights Blvd.
Detroit 20, Michigan

Tool Hints

If you have an idea that you would like to get better tool life on a job than you are getting, do these things and you may find you were right:

1. Check for vibration and chatter and eliminate all you can. Both are deadly to tool life.

2. Check whether the rake angles are correctly ground. There is a best combination for any job.

3. Check whether you have the ideal combination of speed and feed.

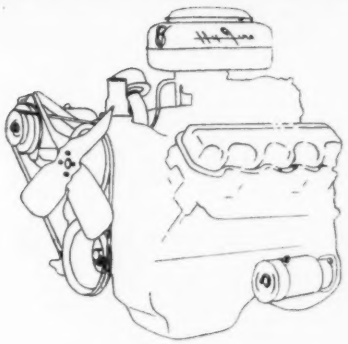
4. Check whether tools are changed before they get too dull. Dull tools wear faster than sharp ones. Keeping them at work is false economy.

5. Check tool after each sharpening against the tool PRINT. This is excellent insurance.

None of these suggestions are new. But they are still keys to better tool performance.

(P.S.—A sixth method is to call in a Wesson man)

A Plant Is Born



THE PLYMOUTH QUALIMATIC V-8 engine plant story represents a true milestone in **TOOLING & PRODUCTION'S** "career" of conveying metalworking knowhow and showhow from those who have it to those who need it.

It is a rare honor for a publication in our field to be accorded the privilege of presenting in the words of a top manufacturing management team its play-by-play account of the conception, implementation and successful functioning of a $50,000,000 manufacturing enterprise.

Each of our distinguished authors gave us two stories of his part in the project. One of his stories is printed herein. The other is for you to read between the lines. We are sure that from between the lines you will have no trouble sensing the important but intangible package of engineering skills, spirit of cooperation, eager acceptance of responsibilities, and pride in managerial craftsmanship which motivated each member of the team.

From their printed stories there is one overall and predominant lesson that can be learned: the more that product design and product processing can be done in collaboration, the more there can be attained in opportunities to introduce innovations and departures from precedent which result in increased productivity, reduced unit costs, and higher and uniform quality.

Witness the machining of the oil pump body. When it was determined that transfer machining would be the most advantageous technique, the product design boys were enabled to make the all-important contribution of two ribs cast on the pump body to provide for location and transfer.

You will find other instances where component casting design details aided in all stages of processing, assembly, and even final engine hot test.

You will welcome the descriptions of many other innovations which will serve as an effective blueprint for other manufacturers, large or small, to follow.

Throughout the plant's processing lines you will note the widespread utilization of horizontal machine spindles, and you will appreciate what this means in ease of access, thus facilitating tool changes and minimizing downtime.

The mechanized engine assembly, involving two cylinder head assembly machines, each 120′ long, and one final assembly machine 565′ long, is a creation of most impressive magnitude. You will see, however, that what it takes to make it work is ingenuity and meticulous attention to detail applied to satisfying its appetite for small parts.

Compartmented and color-coded small parts trays are systematically hopper-loaded and distributed to the successive assembly stations, so that not only is there a place for everything but everything is in its place at the right time. For 150 engines per hour this represents the ultimate in small parts traffic.

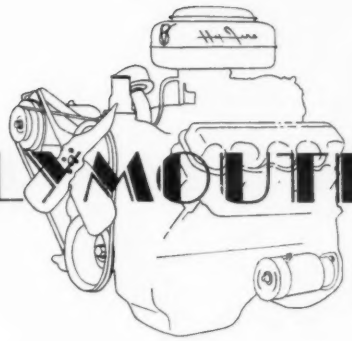
From the machining area, cast iron dust is disposed of, downwardly, by 610,000 cfpm of air passing through machines and trenches, to be filtered and returned into the production area cleaner than outside air. You will agree that this is a major achievement in plant housekeeping and employee health protection.

One of the greatest contributions to holding maintenance operations and trouble shooting and downtime to an irreducible minimum is the system of master electrical control panels on bridges over the processing lines. The resultant ease of identifying and isolating electrical hookup gremlins has resulted in a 75% drop in time so consumed.

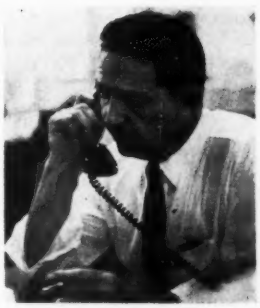
One account of successfully facing a valve seat and boring a valve guide hole at one station with one spindle and holding concentricity to 0.0005″ for two such diverse operations is well worth pasting in your mental scrapbook.

In brief, if you have an uncontrollable urge to build automobile engines, and a spare 50 million dollars, here's how it's done!

—The Editors



THE PLYMOUTH STORY



by Carl J. Demrick
Vice President — Manufacturing
PLYMOUTH DIVISION
Chrysler Corporation

LIKE ANY UNDERTAKING of its kind, the Plymouth V-8 engine story is basically the story of people. While important innovations and unique departures were created in the program, these are the achievements of individuals and Plymouth is proud that it has more than its share of the kind of people that make such things possible.

The automotive business, perhaps more than any other, is characterized by its lack of impractical traditions, its willingness to create and accept change, and its high degree of competition. This reflects the kind of people that run the business of designing and manufacturing automobiles.

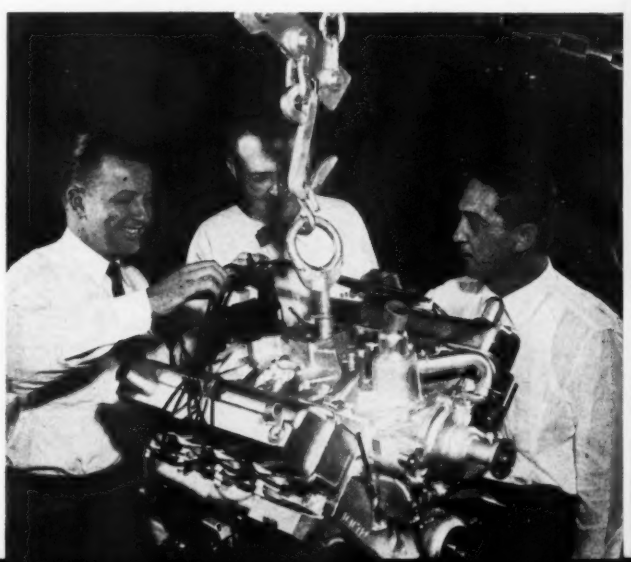
An industry, like a theatre crowd, is a reflection of the people that make up that industry, giving it a personality all its own. It's the American tradition—if it can be called a tradition—to constantly search for new and better ways of organizing, cutting costs, getting work done, and believing that this is the natural way of doing things.

Practically every man who headed up some phase of the V-8 project is a typical example of the young, practical engineer-industrialist imbued with a goodly share of the Yankee ingenuity that makes all industry tick.

To them, the V-8 program was an ideal springboard that would enable them to express freely their limitless belief in progress. It gave them the opportunity to meet a challenge like none they had ever faced before, and it was a challenge that called demandingly upon their experience, intuition, and resourcefulness.

It seems natural then that with the project have come innovations that will provide an effective blueprint for all other manufacturers to follow. It seems natural also that with the V-8 program, Plymouth people have given a deeper meaning to the symbol of the "Forward Look."

Like any multi-million dollar project, this program had one important reason for coming into being—consumer demand! More and



One of the first 1956 Plymouth V-8 engines wins approval of Chief Engineer Robert Anderson, Executive Assistant Lyle W. Blanchard, and Vice President Carl J. Demrick.

more people want V-8 engines than ever before and when the consumer wants them, you've got to produce them.

So great was this demand that Plymouth's position in the face of it can be stated in its simplest terms—it far exceeded our capacity to produce all the V-8's necessary. It was not a matter of choice but necessity that the new V-8 plant be created. The element of time—the one element of which we had very little—influenced every step of the project.

For Plymouth engineers and staff people, this created a multiple challenge. The goal of 150 engines an hour had to be accomplished in twelve months. To conceive, engineer and install radically new processes and equipment in this short space of time more than doubled their problems.

The people involved in the program may defer credit for their accomplishments, but it must be pointed out that the industry standard for completing such a project is two years or more.

A great many factors found Plymouth ready to tackle the project and contributed to its being in production within ten months after the first purchase order was placed. One factor was the decentralized or "divisionalized" corporate management structure extended to within the Plymouth Division—the vehicle which had enabled key men to grow up in the organization. During the program, this system helped these men to hurdle red tape and bypass detail. In short, it helped them to get the job done.

What's important is not the structure itself but what it helped to accomplish in making leaders and team men. With the system, they were able to face "on-the-spot" decisions, to accept increasingly more and more responsibilities, to learn detail and to learn to avoid unnecessary detail.

Each of these men in his own right has made innovations in processes, introduced new methods for increasing efficiency and lowering costs. Despite odds, each learned to persistently dis-

Automatic hot testing of every 1956 Plymouth V-8 engine is but one of many notable achievements made in the fabulous new "Qualimatic" engine plant on Mound Road, Detroit.

Design-production problems frequently result in impromptu conferences on the management level. Here a tough casting problem gets the full attention of top design, planning, tooling, and production men.

play a confidently optimistic attitude, intuition, and flexibility.

We believe that today's engineering and management staff at Plymouth represents the second generation at Chrysler. Typical of this generation is 33 year old Ray McCarroll—youngest staff Master Mechanic in Plymouth history and one of the key men in the V-8 program.

While group action and decisions entered into process and equipment methods and selection, McCarroll influenced every decision made. Virtually every important advancement in processes and equipment utilization in the new facilities was conceived by McCarroll.

A realistic and resourceful engineer who grew up in the organization, he implemented several short-cuts and red tape cutting procedures at the start of the program that proved to be highly important in bringing the program through on time.

In the automotive industry, it's not unusual to hear product engineers referred to as a "gang of butchers" anxious to cut down every suggestion or request for design change originating from manufacturing people. Plymouth's Master Mechanic will be the first to take exception to such a view and for a very good reason.

It was easy for the manufacturing committee to agree with McCarroll's conviction that processing of the engine would have to be done simultaneously with the actual designing of the engine. The "quality" outcome of such a procedure rested entirely on the ability of Manufacturing to work together with Product Engineering.

Indicative of McCarroll's ability to get people of seemingly divergent interests working together in harmony was the degree of integration of Product Engineering with the processing group that he achieved throughout the project.

Another factor which helped to turn this procedure into real advantages to both groups was the splendid cooperation of Bob Anderson, Chief Engineer. Anderson belies the contention that product engineers resist interchange of ideas and suggestions from Manufacturing.

Anderson, like McCarroll, grew up in Chrysler and is the youngest Chief Engineer in Chrysler history. He has a knack for turning problems into "opportunities" for improving design or function. This turned out to be the case many times in the processing-design phase.

What was thought an impediment at the time, the transfer of Plymouth's engine design man, Bob Rarey, to the Chrysler Corporation's Central Engineering staff group shortly before the project broke, proved later to be a blessing in disguise. He was slated to handle the lion's share of design work on the new V-8.

When a group of young engineers grow up together, much like the members of a family, they almost instinctively know how each other thinks and Bob Rarey had worked with McCarroll and his staff for several years. His knowledge of McCarroll's objective provided an ideal opportunity for Manufacturing to influence original design.

At the start of the program, Johnny Anderson, Chief Tool Engineer, and Henry Ibser, Assistant Master Mechanic, tied the processing and design engineering groups together by setting up headquarters right with the designers. Most of the liaison covering changes and design and process features was handled by them on a person-to-person basis.

We have always felt, "You can eat an elephant if you cut him up fine enough." This is what we did with the program. Many of the pieces dished out were pretty big chunks, and Bill Allen, our Plant Engineer, finds it tough to disagree.

Allen's part of the program was an undertaking that staggers the imagination. It was not until processing was nearly completed that he finally acquired a plant to house the V-8 facilities. It was his responsibility to get the building ready.

Allen's group in one two-month period, poured 17,000 cubic yards of concrete and ran one cement company right out of cement. They wired the plant from an original 1100 kilowatts to over 200,000, pulling an average of 100,000 feet of wire per week. They also made additions to the building totaling 71,000 square feet in just a few months.

At the same time, Allen created and installed several radically new innovations in chip disposal, in coolant and ventilating systems, and in unique materials handling systems, such as the small-parts tray units feeding the mechanized final assembly line.

An exacting road map and timetable had been set up at the start. Deadline for maximum production was October 15th, 1955; this to be achieved in three stages—50 engines an hour by August 15th, 100 engines an hour by September 15th, with maximum production of 150 engines an hour to be achieved by October 15th.

Wes Embury was assigned by Central Purchasing to handle all procurement activities for the project. He began releasing orders in September. All orders had to be placed by December 1st. There were but few exceptions. As orders went out, the program spread to every part of the country. Every job started seemed to create ten more.

Six months had been picked up by the simultaneous development of processes and engine design. Still more time was gained by adapting a unique supplier-vendor process, and by vesting a magnitude of responsibility in suppliers here-to-fore unheard of in the industry.

Much like the engine design-process stage, here again McCarroll provided the key which made possible the radically new procedures for supplier-participant selection. By and large, McCarroll knew before calling in suppliers exactly what processes would give him the lowest unit cost and highest quality per piece.

The problem then for suppliers was to engineer equipment and tooling that would accomplish McCarroll's cost and quality—"Qualimatic"—objectives. The usual procedure of submitting one process, or a series of processes, in competition with another therefore was eliminated and—with it—the gain of an additional six to eight months.

The procedure permitted Wes Embury and Ray McCarroll and the other members of the committee to choose their suppliers by a highly selective process. After having chosen a supplier, Embury put his entire purchasing department behind the supplier as though he were actually a division of Plymouth.

Jack Powell of Planning and his staff got their cue to jump in from Ray McCarroll & Bill Allen when they began to project tryout dates for equipment. Powell had one primary objective and not an easy one—to procure, for machine tryouts, castings and forgings from permanent pattern equipment.

Two months later, Jack Ondrus of Budget & Time Study started laying out the best continuity of operations for manpower placement on the lines. Working with the Master Mechanics, Plant Engineers, and Planning, he came up with a complete picture of cycling, manpower, and costs on each part about the time the first machines were going down on the floor over cement just barely dried.

The final step was the entrance of Production into the plan; and Lyle Blanchard who functioned as Production Coordinator started in May to get supervisory and production people. While his men were taking active part in helping each of the other internal departments, they were also being trained to take over the job of producing engines on the specified target dates.

Most of these superintendents and foremen lived with equipment as it grew from designs until it went into operation at the plant.

* * *

It is virtually impossible to draw a word picture of the mountainous detail encountered and the degree of coordination and teamwork accomplished by this staff group of engineering and management.

It is equally impossible to describe the impelling drive and enthusiasm of every employee in the project. Each day and frequently half the night, they stayed with their respective jobs with an awareness, it seemed, that upon the completion of each task would rest the outcome of the entire project.

Plymouth has gained more than a modern V-8 engine facility and a position of leadership in the industry—it has gained a whole new family of employees and supervisors charged with a dynamic enthusiasm and an awareness that they are part of progress at its best.

Award of Appreciation Climaxes Plymouth's Ideal Supplier Relations

by Wes Embury
Purchasing Agent
PLYMOUTH DIVISION
Chrysler Corporation

ANY LARGE MANUFACTURING ORGANIZATION is dependent upon its suppliers for many kinds of services. Almost all manufacturers consider the contributions of these suppliers important to their success in business. Plymouth is no exception.

In the V-8 engine program, however, we believe we have given a deeper meaning to the manufacturer-supplier relationship. In a very real sense, suppliers to the program became an integral part of the Plymouth organization itself. Probably never before in the industry has such a relationship existed . . . on the same broad scale.

Also important is the new interpretation of the term "competitive" which was created in the program. Usually, "competitive" is understood to mean relative equality of **price** between a number of bidders on a particular job or piece of equipment. Price was important in our program, but it was appraised on a much different basis than mere dollars.

Basically, these two features constitute the primary differences between procurement for the V-8 program and the ordinary tooling-up process. These differences, adapted for expediency, helped to complete the program efficiently and on time.

The importance and extent of these new procurement concepts and their possible influence on future methods can best be illustrated by comparison with so-called standard procedures.

In the average program, known suppliers of engineering services or equipment and tooling to be used in manufacturing the end product are called in and asked to come up with equipment or tooling to produce the required production at the lowest possible cost per unit produced. On many of the standard or semi-standard machines and tooling, competitive prices are compared. The same applies in general to special equipment. However, the purchase order almost always goes to the lowest bidder. Where such a procedure is in effect, many hundreds of suppliers must be contended with in the quoting process.

When the order goes to the lowest bidder, follow-up services are not always provided. There are several reasons for this. Either the supplier does not have the field staff necessary to service his products extensively, or he cannot economically provide more than routine service at the price quoted. In either case, the burden of "making it work" falls on the manufacturer.

Plainly, the number of suppliers or bidders contended with in an average program could not be handled in the V-8 project because of the time element. Further, Plymouth required complete pre-order and post-order services by the supplier. In the case of many of the major suppliers, continuous service was expected until long after final installation.

Several factors favored the procurement practices and policies initiated and also made these practices effective. First, the processing engineers knew exactly what they wanted in processes and equipment. Secondly, Purchasing knew from experience what suppliers were most qualified to engineer and install — on time — the equipment and tooling for these processes.

The entire manufacturing committee at the start of the program spent many, many hours going over processes and evaluating them in terms of specific suppliers. These conferences determined what suppliers would be considered.

Each supplier selected to quote on a particular machine or group of machines, or tooling, had to meet extremely limiting qualifications. He had to have the capacity to produce on time. He had to have complete engineering staffs including field engineers for "in-plant" service. Primarily important, he had to have the quality of product that would conform to the standards and performance requirements of the Master Mechanic's staff.

Of equal importance, many of the suppliers had to assume complete responsibility for some one major portion of the program. Rather than break up the program into too many pieces, each machine tool builder would be responsible for a section or group of sections in a line. In some cases, this would even require his sub-contracting for machines from other machine tool builders.

One company was responsible for all carbide cutting tools used throughout the plant. Another company was charged with the responsibility for all air gaging equipment.

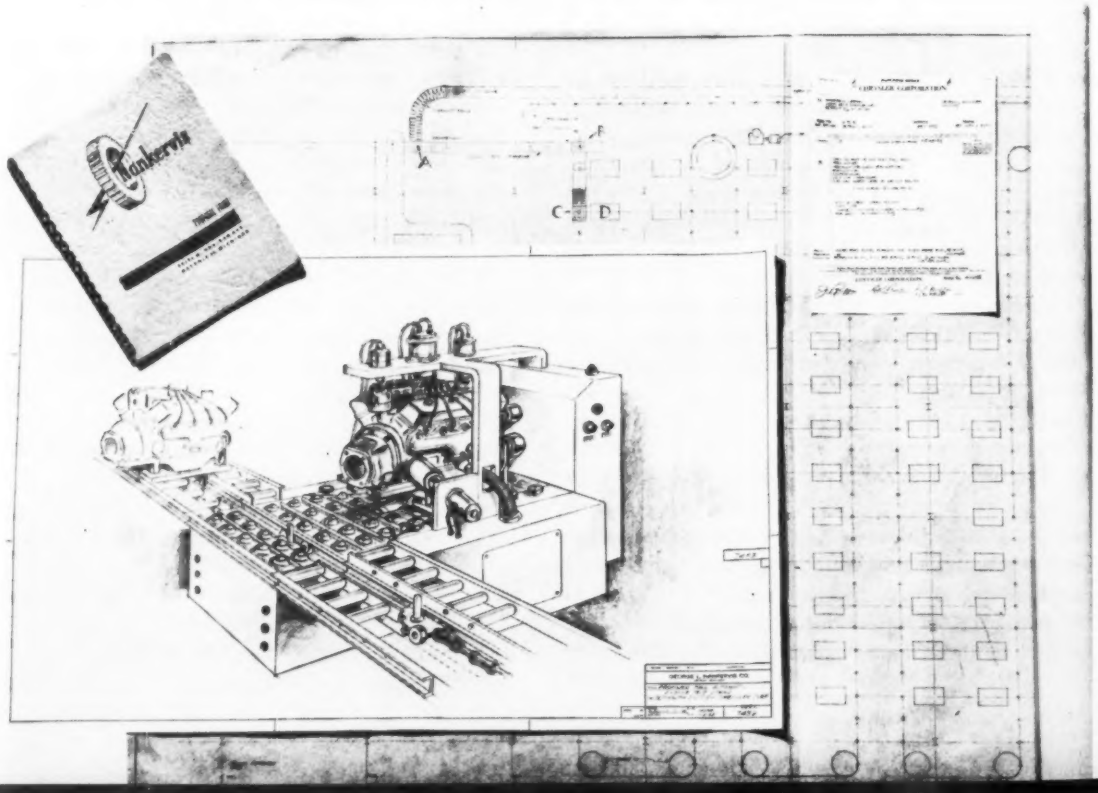
It is perfectly obvious, then, why it was so essential to select the program suppliers — the major suppliers — by the highly selective process established by the manufacturing committee.

Many of the suppliers participated as a result of direct specification of their products by the Master Mechanic's staff. Product specification, however, involved only those products or components chosen to fulfill "standardization" objectives of the Master Mechanic's engineers.

Conversations with key suppliers were initiated in July, 1954. The Master Mechanic and his engineers discussed every detail of operations to be performed, including sequence and standardization requirements. In these initial meetings with suppliers, estimates of delivery were arrived at. At this time, the high-quality requirements of the program were discussed. Quality capability of machines built by each supplier was to be expected.

As each of the suppliers returned with quotations and rough layouts of equipment type and design, these were compared with an average of four other quotations and analyzed for engineering, design, incorporation of standard units, serviceability, hydraulic systems, etc. While 1100 quotations were received, only 52

Indicative of the speed with which the Plymouth "Qualimatic" engine plant program moved is this supplier's proposal for the automatic hot testing facility, dated January 5, 1955, and the Plymouth purchase order, dated January 12, 1955. This was the last major equipment order placed for the new V-8 engine plant. Test stand sections were in operation at Plymouth by August 8th.



major suppliers were selected to handle the major portion of the program being administered by the Master Mechanic's staff. Purchase orders were released to these suppliers between September and December.

The program timetable called for release of all orders for major production equipment before December 15th. This deadline was met. Orders for equipment destined for those production lines requiring the greatest lead time were processed first. While the routine processing of paper work is mountainous in a program like this, it was pushed through unusually fast, thus illustrating an important fact.

Ordinarily, the paper work involved in the volume of orders and quotations inherent to a program of this size is rarely completed at the time orders must go out. It is almost always necessary to go back over details and to complete the paper work after the program is finished. Such will not be necessary in our program.

The reason for this is the impelling drive and enthusiasm with which every individual in Purchasing went about his job. He approached routine tasks as though the outcome of the entire project rested upon their completion. Everyone involved was constantly aware of the urgency of every part of the program and this awareness was contagious.

Between January and February of this year, Engineering was flooded with final drawings. As each supplier received his approval for his final drawings from the Master Mechanic's staff, he was called into conferences with Purchasing.

The primary object of these conferences was to determine what Plymouth Procurement could do to assist the supplier in getting his equipment produced as economically as possible in the shortest possible time.

Almost all machine tool builders, like Plymouth, depend on many suppliers of component parts. These include castings, forgings, electrical panels, switches, hydraulic systems, bearings and hundreds of miscellaneous other parts. Naturally, if the delivery of any of these machine tool components were held up for any reason, the delivery of the machine to the V-8 plant would be held up.

Therefore, during negotiations with the supplier, every possible method for speeding up delivery was investigated. If estimated delivery on any component seemed unnecessarily long, Purchasing immediately went to work to get these components from another source.

In many cases, the help given to the machine tool builder in procuring machine tool components knocked off as much as three months from promised delivery dates given originally.

On August 19th, Plymouth management threw open its V-8 engine plant doors to welcome all suppliers who had played an important role in the program's success. The "Open House" was seized by suppliers as an opportunity for floral and verbal bouquets directed at Plymouth executives, but primarily was the occasion for Plymouth to express its gratitude for a magnificent job well done by the Plymouth V-8 program suppliers.

This help was in addition to the close working relationship effected between each machine tool builder and the several key suppliers—of carbide cutting tools, of centralized lubricating equipment, of air gages, and of hydraulic equipment. Thus, each builder's engineering staff was supplemented by a group of specialists already working closely with Plymouth personnel and well acquainted with the rigid requirements of the "Qualimatic" plant.

Plymouth was prepared to help the supplier in other ways. The Master Mechanic's staff worked closely with the major equipment builders throughout the months preceding

shipment of the machines, even assigning tool trouble men in some instances to work right in the supplier's own shop. If modification appeared to be advisable, that Plymouth man had the power of on-the-spot decision. In the case of electrical circuitry, our Plant Engineer assigned an electrical technician to work directly with the supplier while a machine was under construction.

It must be clearly stated that all the procurement practices in the V-8 program were not as initially conceived. They evolved as the only means of completing our accelerated program on time.

However, there is a great deal to be said favoring these procurement methods in any tooling program regardless of time limitations. In effect, any procedures that tie the manufacturer and supplier closer together can only result in many benefits.

In January, Carl Demrick, Vice President—Manufacturing, called in the top managements of the entire supplier group for a discussion of program objectives and a re-emphasis of the necessity for delivery dates to be met.

This conference was perhaps not intended as a "pep rally", but definitely served the same purpose. Every supplier in the program from the president down to the men in the shops exerted maximum effort in achieving their part of the program on time.

The total procurement cost in the V-8 program was close to $50,000,000 and it is clear that no finer equipment than the machines and tooling going into the V-8 plant could be purchased — all without one cent of premium.

Going into the program, the entire manufacturing committee agreed on one thing — "You get exactly what you pay for." From a procurement point of view, we must take exception to this. Plymouth got more than it paid for in the V-8 program, for Plymouth had been fortunate enough to acquire the leadership position in "know how" for bringing many people together to create an engine facility that is second to none.

PLYMOUTH

Award of Appreciation

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THE COMPLETION OF THE NEW PLYMOUTH ENGINE PLANT IN RECORD TIME

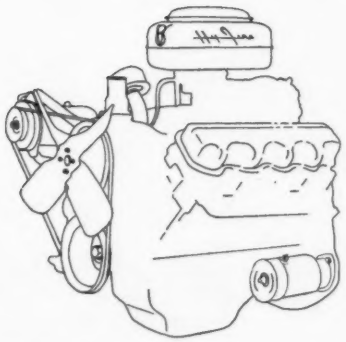
CONSTRUCTION BEGUN JAN. 22, 1951

PLANT COMPLETED JULY 15, 1953

John P. Mansfield

PRESIDENT PLYMOUTH DIVISION CHRYSLER CORPORATION

This "Award of Appreciation" has been tendered to each supplier firm who played an important role in making the Plymouth "Qualimatic" V-8 engine plant a reality within an amazingly short number of months.



Many Technological Advancements Made in Plymouth Engine Plant

by R. A. McCarroll
Master Mechanic*
PLYMOUTH DIVISION
Chrysler Corporation

TO ENUMERATE THE MANY IMPROVEMENTS, innovations, and specific objectives in the V-8 program would be comparable to the job of pouring Lake Michigan into a quart bottle . . . it just can't be done!

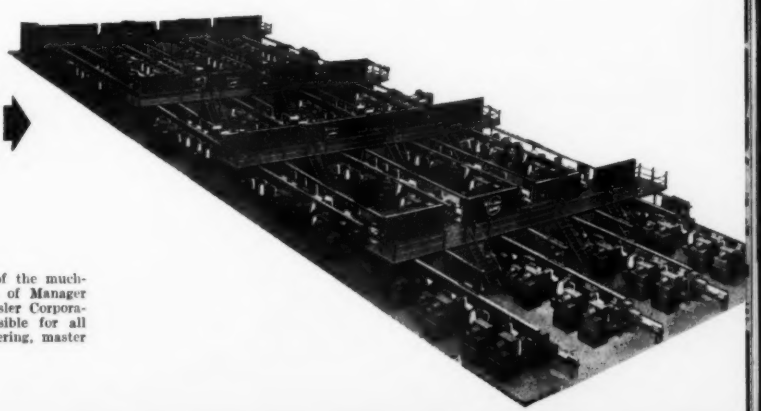
However, if the three broad objectives in processes could be boiled down to represent hundreds of secondary objectives, they would be (1) quality production, (2) low cost production, and (3) constant and dependable production.

In a way, the "Qualimatic" V-8 engine plant can be compared to a "vintage crop." Such a facility comes along only once in a great while and is the result of a great many things that occur at exactly the right moment in exactly the right way.

V-8 process or equipment innovations are not just a varied way of doing the same old things, but a much improved method of doing what has been done in the past.

Not every problem has been solved 100%. Although there are still improvements to be made, equipment and processes in the V-8 plant are believed to be the nearest approach yet to maximum efficiency possible with today's materials, machines, and best collective engineering know-how.

To appreciate our V-8 equipment designs and processes, the reasons and reasoning behind them should be understood. It should also be disclosed how these things were made possible and what Plymouth is achieving with them.



Scale model of cylinder head lines reveal manufacturing concepts behind the planning of the new Plymouth V-8 plant. Flat lines, overhead control deck, below-floor services, segmented and sectionized machine construction, and automatic gaging are among those ideas incorporated in this model.

*As this October issue goes to press, we the editors learn of the much-deserved promotion of Mr. R. A. McCarroll to the position of Manager of Industrial Engineering for the Plymouth Division of Chrysler Corporation. In his new position, Mr. McCarroll will be responsible for all activities related to staff operations, purchasing, plant engineering, master mechanic, time study, and estimating

Throughout the Plymouth production lines are quality control stations such as this machine control setup in the cylinder block line immediately following the Ex-Cell-O 4-way boring machines, where Babbit-bushed camshaft bores and the crankshaft bores in the block were finish line bored. The block enters this air gaging station on edge. When the block is positioned for gaging, with the open crankcase facing the gage head, an air actuated slide feeds in carrying the gage plugs between webs in the block. When plugs are on centerlines of the crank and cam bores, another slide feeds endwise, bringing each of 10 air gage plugs into their respective bearing bores. Lectrolair units amplify the signal produced and by means of colored-light banks indicate undersize, approach to undersize, on dimension, approach to oversize, or oversize. In the event of an out-of-tolerance part, the control station will signal the guilty boring machine to shut down.

Like any other manufacturing project, the first step in producing the new V-8 facilities began with actual design of the engine. Common industry practice is to follow this step with the development of processes. An entirely new approach, however, was used in the Plymouth program.

From the manufacturing viewpoint, it has always been unsatisfactory to proceed with processing only after the completion of engine design because the engine design is dictatorial. After it is completed, process engineers have relatively little latitude in which to vary machining methods.

Years ago, product engineers were excellent tool men and could design an engine for best performance as well as manufacture. In recent years, however, engine design has become a highly specialized field just as tool engineers have become highly specialized. Most designers have little experience with problems of manufacture. Consequently, these two groups have grown farther and farther apart.

The Master Mechanic's staff realized at the start that attainment of their conception of "ideal" manufacturing methods depended entirely on engine design and, therefore, the extent to which they could influence the engine designers to make these methods possible.

Oddly enough, the time limitations of the whole project worked in favor of manufacturing. To save time, which was at a premium, it was imperative that processing be done simultaneously with engine design. This required total and complete coordination of both functions.

So right at the start, Johnny Anderson and Henry Ibser, two top staff men of the Master Mechanic's group, set up headquarters with the designers; hence, manufacturing thinking went right into the original engine drawings.

The benefits and advantages resulting from this integration were so important in making new processes and machining methods possible that identical procedures will be followed in all future tooling programs.

In the plant today are hundreds of specific examples of new manufacturing techniques employed that were made possible by influencing design. In fact, almost every new and important innovation in processing is the direct result of this procedure.

For example: By having pistons designed so as to roll, and with an indexing notch on the OD, a completely mechanized piston machining line was made possible. The basic concept and form of the entire block machining line was made possible by incorporating location pads into original block design. Location pads on the engine block also provided the key to the mechanization of engine final assembly.

By permitting process engineers to work closely with designers, maximum efficiency in manufacture resulted. These engineers became familiar with functional characteristics which were later reflected in processes, while the designers acquired from them a greater insight into manufacturing problems.

To understand the thinking going into development of processes and specific methods of machining, transferring and assembling of the engine components, the limitations and the problems in other engine facilities in the industry should be reviewed.

Actually, this was the same approach made in engineering, designing, and laying out every operation in the new plant. Plymouth V-8 engineers had intensively analyzed existing installations in the industry for more than two years.

The problems that existed cannot be broken down into any single category. For example: when downtime occurs, costs are affected. When costs are out of line, they affect every phase of manufacturing.

Naturally, costs are vitally important and were critically analyzed before going ahead with processing and every other phase of the project.

It is a well known fact that as mechanization increases in the industry, direct costs are reduced while indirect costs go up. In many cases, they amount to more than the savings in reduced direct costs. In effect, most mechanized facilities have just transferred costs from one column in the ledger to another.

An interesting and perhaps unique viewpoint was brought into planning meetings by the men assisting in process development.

They directed their sights on minimizing indirect costs, with facts and figures to prove that they were well justified in concentrating on this cost area which promised a great opportunity to really cut cost.

In engineering processes, machine designs, transfer devices, etc., quality was given first consideration. However, for reasons which are obvious, costs played a part in every decision made to achieve quality.

Gaging of machined surfaces is progressive in each of the block and head lines. Air gages are an integral part of some of the machine tools. If gaged surfaces do not fall within the tolerance limits specified, the casting is ejected automatically.

The most important quality control innovations are the methods by which certain critical operations are being performed in the block, head, clutch housing, and other lines.

The greatest single problem in controlling quality of manufacture has been the process inability to hold critical dimensions on parts where near-perfect alignment must be attained. The main cause of this problem lies in the fact that the required operations always have been performed successively in more than one station. When a number of holes are bored, or drilled, or reamed in a workpiece in more than one station and these holes must be held in perfect alignment with each other, inaccuracies and poor quality are bound to result since clamping is never exactly the same from station to station.

These difficulties have been overcome in the new V-8 plant. A few of the many critical operation combinations being done now in one machine which formerly were machined in two or more, are the following:

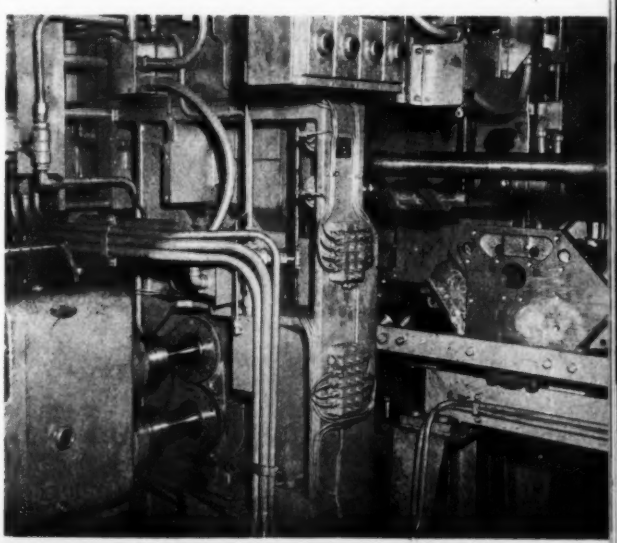
1. On the block line, one 4-way boring machine is finish boring the main bearing, camshaft bushing, distributor shaft, and oil pump shaft holes, and the dowel holes at one end of the block, and is milling the oil pump pad. These six operations are being performed in one machine and relation of each dimension to all others is held very accurately.
2. The most critical of all operations in engine manufacture is the machining of valve guide holes in perfect relationship to the valve seat. This operation, usually performed in two stations, is now being done in one, and a concentricity of 0.0005" is held between the seat and valve guide hole.

The concept of performing multiple operations in as few machines as possible is not new. Actually, fewer and fewer machines are required for more and more operations each year.

For example, it was not long ago that as many as 12 milling machines were required to work the flat surfaces of engine blocks at the rate of 110 an hour. Today, two broaches machine these surfaces at the rate of 140 an hour.

In striving for quality in other areas of the plant, a whole new concept in mechanized cylinder head and final engine assembly was created. The same principles of mechanization have been applied to many sub-assembly operations throughout the plant.

By securing bolts and nuts by machine, a more uniform torque is maintained. On



After bearing caps have been installed, the engine block is line bored for both camshaft and crankshaft simultaneously in order to hold exact relationship of these bores. Boring bars reach all the way through and are piloted at both ends by rotary bushings.

HENRY IBSER
Asst. Master Mechanic

JOHN ANDERSON
Chief Tool Engineer

DAN McCARTHY
Supt.—Tool Division

KEY MEN
in the
TOOLING-UP
of the
PLYMOUTH
Qualimatic
V-8 ENGINE PLANT

the new assembly line, air-operated nut runners automatically engage nuts and bolts to a specified uniform torque.

The basic concept and form of the head and block lines is in the predominant use of horizontal spindles. The justifications for this form of line are two-fold: accessibility of tooling for quick tool change and greater rigidity of machine spindles.

Actually, there are many safeguards that have been made against non-predictable downtime. There are also many process and equipment and tooling features that minimize predictable downtime. Additionally, every provision possible has been made to get equipment back into production as rapidly as possible in the event of downtime for any cause.

Prevention of downtime begins in the foundry. The castings for head and block line machining are the highest grade attainable, through quality control of the complete casting process. At the same time, these castings are being produced with extremely close limits on stock to be removed.

Before any casting is processed into machining lines, it must first pass through a qualifying machine. Any castings that exceed the specified dimensional limits are ejected immediately.

In making the decision to go to broaching for the flat mating surfaces of the cylinder heads and blocks, casting specifications and dimensional limits for stock to be machined played an important part in the choice. While broaching gives a greater production of parts per hour than milling, in comparable machine investment, one of the principal sources of broach downtime in most engine facilities has been tool breakage as result of excessive chip loads or "hard spots" in low quality castings.

Following any drilling, reaming or tapping operation in the head and block lines are automatic "probing" stations equipped with feeler gages to insure that holes have been machined, machined to the proper depth, and are free of broken tools. If no hole exists where there should be a hole, the machine is stopped automatically at that point until the cause of the defect is rectified. This safeguards succeeding operations.

There is no place in today's mass production chain for a weak link. For that reason, all machines are equipped with large diameter spindles for maximum rigidity.

Also, air gaging is employed to check dimensions after many machining operations. If tolerances are exceeded, the machine operators are informed immediately by means of colored lights at their control panels. At the same time, one of three lights on top of the machine will go on automatically informing area tool men of the trouble, and adjustments are made in a matter of minutes.

Control bridges over the cylinder head lines carry Detecto panels that facilitate the tracing of electrical failure to a specific control device or circuit wherever it may be located in the equipment below. In center foreground is a Toolometer type of tool control board such as is used throughout the plant to indicate anticipated tool life, and to indicate when cutting tools should be changed. Board carries preset replacement tools in pockets designated for each operation in the neighboring machines.

In anticipation of downtime for various reasons, every technique and method possible to minimize that downtime has been incorporated into the equipment.

If the trouble is electrical, it can be located immediately by means of "Detecto Panels" over the head lines. Electrical probes passing through holes over a printed circuit will cause a light over a faulty circuit to flicker, thus indicating the exact location of trouble.

Through standardization of circuits, panels, limit switches, etc., electricians are able to remedy electrical trouble rapidly. Similar standardization has been achieved in hydraulic systems. Only two types of hydraulic systems are employed throughout the plant.

Quick change tooling is employed thus permitting rapid replacement of damaged or worn tools. This feature, in combination with the accessibility of tooling through the use of horizontal spindles and provision of aisles between work stations enable the tool setter to stand on the floor in changing tools.

On most of the machines used in the plant the spindles are permanently mounted and are non-adjustable. Using special cutting tool control boards, all tools are pre-set and kept ready for use at the machine. This eliminates tying up a machine for tool adjustments.

In cycling of machines, "reasonable" speeds and feeds have been established for **maximum** possible tool life both with carbide tooling and high speed steel tooling. This prolongs the period between tool changes.

Reasonable speeds are relative, having been determined by tool design. One example is the feed employed in finish milling the top and bank faces of the block. The milling cutters have four teeth per inch of diameter for minimum chip load and are feeding at 73 ipm. For such a cutter design, this is considered a reasonable feed.

Our production requirements are such that we have four parallel head lines, all virtually the same. Also, we have two block lines. If for some reason a machine cannot be put back into operation within minutes, the lines are so flexible that blocks or heads can be transferred into a "bank" or from one line to another. Stations for this purpose are located within the lines. Downtime history will indicate how much of a bank should be maintained where, so that one machine section can be shut down without stopping the entire line.

Actually, there are many other provisions in processes, equipment tooling and components that will keep the V-8 lines the "goingest" lines in the industry. But in spite of all these provisions, the key to constant quality production lies with the people who make up the service groups.

Realizing that in spite of every efficiency engineered into the production lines, this efficiency could be dissipated rapidly without top notch service groups. The nucleus of men making up each of these groups was organized early in the project.

Three main groups—Service, headed by Dan McCarthy, Tool Engineering, headed by John Anderson, and Tool Trouble, headed by Ed McCormick and John Pietrangelo—were set up first. Pretty much like a football team, specialists were brought together within each group.

The Tool Trouble group, like Tool Engineering, was split up into two sections—Ed McCormick, over cast iron, and Johnny Pietrangelo, over steel. In turn, area tool troublemen were assigned to specific parts of the plant.

Working directly with each Tool Trouble Chief were two key specialists. One is a tool expert and the other is a hydraulic expert.

Plant Engineering, at the same time, assigned area engineers who were responsible for stock handling, electrical and floor plan layout, to each tool troubleman.

These men form the corps of service specialists who performed wonders during the tooling-up process in getting equipment going. Theirs will be the job of keeping it going and improving on it as they go. They are particularly well qualified and especially well trained for their responsibilities.

When equipment was being manufactured and assembled in supplier's plants in the early part of the year, these men went out and lived with designs through manufacture, tryout, and final installation in our plant.

For some time after equipment was in operation on the floor, they worked with Production Foremen in getting out service parts by actually running machines.

The hydraulic specialists spent considerable time going through two supplier schools devoted exclusively to hydraulics—the two types of units standardized on throughout the lines.

To conceive of processes and methods is one thing. To build equipment to make them possible is something else.

In the final analysis, program objectives have been accomplished. And, these would not have been possible without the participation and superior effort of the many machine tool, cutting tool, and equipment engineers.

There are many who said it couldn't be done, but these engineers who made these processes and methods possible were too busy doing it to listen.

How Men Were Selected And Trained to Operate the QUALIMATIC ENGINE PLANT

by Lyle W. Blanchard
Executive Assistant
to the Vice President - Manufacturing
PLYMOUTH DIVISION
Chrysler Corporation

IN THE MANUFACTURE of almost any product, the assignments of the production group are usually well defined activities. This is equally true of their responsibilities in a tooling program and in the pre-production operations of a new manufacturing facility.

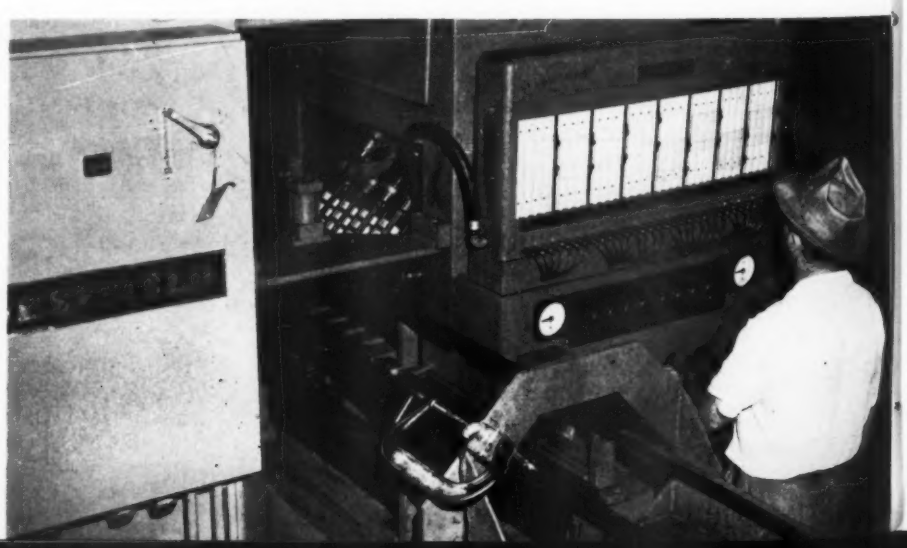
In the Plymouth V-8 program, however, the assignments of this group were a multiplicity of many varied jobs that reached almost every activity in the final phases of the program.

Foremost assignment for this group was the procurement and training of over 3,000 personnel from the supervisory level to the fledgling production worker who was stepping into an engine plant job for the first time.

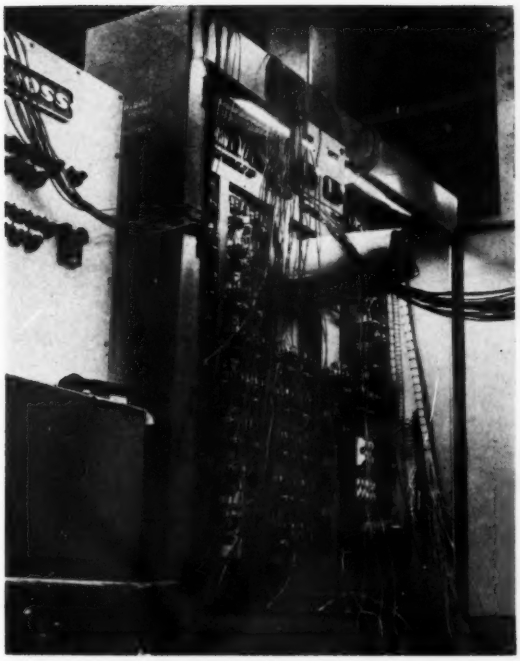
A ticklish scheduling problem complicated the training of these men. The schedules for taking on experienced and inexperienced workers with aptitudes for production work had to be carefully paced to preclude any possibility of over-hiring at any point before going into production.

In solving many of the training and personnel problems, complete coordination was effected with the Master Mechanic's group, Plant Engineering, Budget & Time Study, and Planning. Limitations of time and personnel, and pre-production requirements of service parts and in-process floats before actual production provided many of the answers to these problems.

The first job was to create and to staff the production division itself. This started in May of this year with the selection of the three Production Superintendents and Production Manager by the management and Master Mechanic's staff. The men chosen had been under consideration for these key spots for over two years at the "six" plant.



Representative of the many quality check stations throughout Plymouth's new plant, this automatic inspection station for air gaging cylinder bores stands witness to the care that must be taken in selection and training of personnel for a modern manufacturing facility.



Many miles of "spaghetti" are wired into the control panel for today's automatic production line, indicating the complexity of equipment that necessitates highly trained and responsible workmen.

Working with aptitude test results, these men immediately began to bring in the foreman group. Several of the foremen chosen for the V-8 plant were selected from other divisions of the Chrysler Corporation. In many cases, however, job setters and tool trouble men with special qualifications were moved up to the foremanship level. The foremen in turn participated in the selection of men who would work under them.

The entrance of the production division in May had been well timed with the completion of layouts by the plant engineers. Budget & Time Study was also completing final layouts showing manpower placement throughout the plant. And so, along with the continuing program of building the production team, the production staff immediately tied in with these other groups.

With the Master Mechanic's staff, Plant Engineering, Time Study, and Planning, Production participated in regular "chalk talk" sessions that traced the complete sequence of operations, parts handling, feeding and transferring methods, stock control and disbursement, etc. Layouts on paper traced every step of each part to be machined through the entire plant.

From this point, every move by the production team had to be closely coordinated with one or more of the other major departments. The degree of coordination can best be illustrated by following a single machine from design to final tryouts in the V-8 plant.

(1) Production tied in with the Master Mechanic's group to cover equipment—type, design, supplier, etc.

(2) In coordination with the Master Mechanic's group, Production assigned foreman and job setter to supplier's plant.

(3) One production team continued liaison with the Master Mechanic's group on equipment delivery dates and projected machine tryouts.

(4) Production worked with Planning on scheduling delivery of castings for tryout and service parts.

(5) Production coordinated with Personnel in getting production workers screened for job.

(6) Production recalled foreman and job setter with delivery of equipment to assist in machine set-up.

(7) Production took over machine from Master Mechanic and put foreman and job setters on as operators to learn machine.

(8) Production coordinated with Time Study to determine final cycling, speeds, feeds, and manpower data, etc.

(9) Finally, Production set up schedules for running a limited amount of service parts through machine each day, and broke in other production workers on machine by the running of service parts.

Along with all the complexity of machines and controls come equipment designed to simplify everyday jobs. This Graphic Detector panel permits fast and positive location of electrical trouble.

This procedure helped to accomplish many things. The first objective, the education of these men, was achieved at the supplier's plant and in actually operating the equipment after it was turned over to Production at the V-8 plant.

For some months before Production had entered the program, tool trouble shooters, electrical and hydraulic maintenance men, and machine repairmen had undergone the same "get acquainted" process. These men, already at the supplier plant when production foremen arrived, helped to interpret the highly specialized and technical equipment features for the latter.

At the same time, Production's foremen also acted as expeditors and assisted Purchasing and the Master Mechanic's group in their pledge to get behind the supplier in helping him meet deliveries.

The most important break for the production group at the start of the program in training all personnel was the Service Department's agreement to accept service parts for the new V-8 prior to October 15th—target date for full production. This meant that all production lines could be run on a limited basis immediately after their installation; with output going primarily to Service, there was no excessive stockpiling within the plant.

The scheduling and running of these parts depended on several important factors—delivery of machine tools and cutting tools, and delivery of castings, forgings, and raw material by Planning; and also, contingent upon these two factors, the speed with which production personnel could be brought into the plant.

Not a prime objective but nevertheless an important objective that Production strived to achieve was to bring in the production personnel according to a pattern. Once a production worker had been screened and assigned to the production team, we didn't want to have to lay him off temporarily before going into full production.

In achieving these goals of running service parts and hiring workers, a Master Schedule was made up in cooperation with the Master Mechanic and Planning. Color coded, the chart clearly outlined delivery dates of machines and expected delivery of materials. This chart served as the guide or pattern for taking on production personnel.

The critical color in this chart was **yellow** which outlined the equipment that would be the last going into a line. At that point, all production men required for that particular line could be brought in. Outlined in **red** was the equipment required for the first 50 engines an hour. A **red X** indicated equipment in and ready to go.

Prior to delivery of the last machine in a line, a small core of production workers that had been trained by the foremen constantly shifted from one machine to another in the running of service parts.

The production of these parts was amortized over the number of days remaining before going into full production. For that reason, parts were processed through each station in small quantities. A worker who had started in the morning on the first station on a line may have progressed to the final station on a line by quitting time.

As pilot production gets underway, minor problems of material take on greater magnitude and lead to staff meetings such as this one — with Lyle Blanchard, Carl Berger, Henry Ibser, and Jack Powell participating.

Several important pre-production problems were worked out by this running of service parts. Bottlenecks in the lines, either in equipment, tooling or transfer mechanisms, were worked out. At the same time, the small core of workers rapidly became proficient in the operation of all the machines and could train new incoming workers as August 15th—target date for production of 50 engines/hour —approached.

For key operations such as the honing stations on the cylinder block line and lapping stations on the crankshaft line, specific people were selected from the "six" plant rather than filling these jobs with inexperienced operators. In the main, however, the bulk of the production workers assigned had little experience with such mechanized equipment.

Every effort was made to eliminate all production problems before August 15th. This was particularly true of the castings or parts material specifications. For that reason, Carl Berger, a technical specialist, was placed on the staff to coordinate with Planning on these problems. The idea behind this was simply, "An ounce of prevention is worth a pound of cure."

Actually, there were few casting problems that had to be worked out before the deadline. One of these, for example, concerned the cylinder head and actually did not involve any particular production problem. The spider webbing in the water flow chambers was too narrow in sections and had to be opened up for the maximum cooling of an operating engine.

To insure the highest quality and consistency in casting, the technical specialist worked with Planning, going over every aspect of the casting operation checking for the best location of sprues, control of cooling, etc. By coordinating so closely with Planning, only minor problems in this area have occurred since going into production.

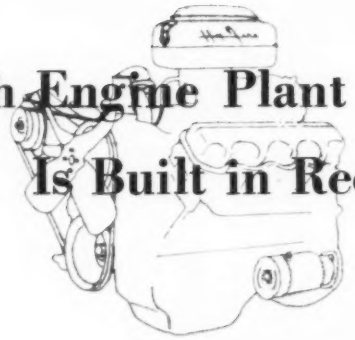
In taking over the Plymouth V-8 production facilities on October 15th, the entire production division is keenly aware of its enviable position in the industry, for it will acquire the finest assemblage of quality equipment ever designed for making quality V-8 engines.

Every aspect of the facility is geared for the consistent, high quality manufacture of V-8's. Every safeguard against breakdown or low production has been incorporated into the equipment.

One thing seems perfectly clear. No production group has ever acquired a facility so clearly earmarked for the degree of success promised in every detail of the Plymouth "Qualimatic" V-8 engine plant. And, it is not likely that this facility will be duplicated for some time to come.

PLEASE NOTE THAT PHOTOS USED IN THE PLYMOUTH STORIES WERE TAKEN BEFORE THE PLANT WAS IN FULL PRODUCTION. CONSEQUENTLY, SOME ACCESSORIES ARE NOT SHOWN.

Plymouth Engine Plant Is Built in Record Time

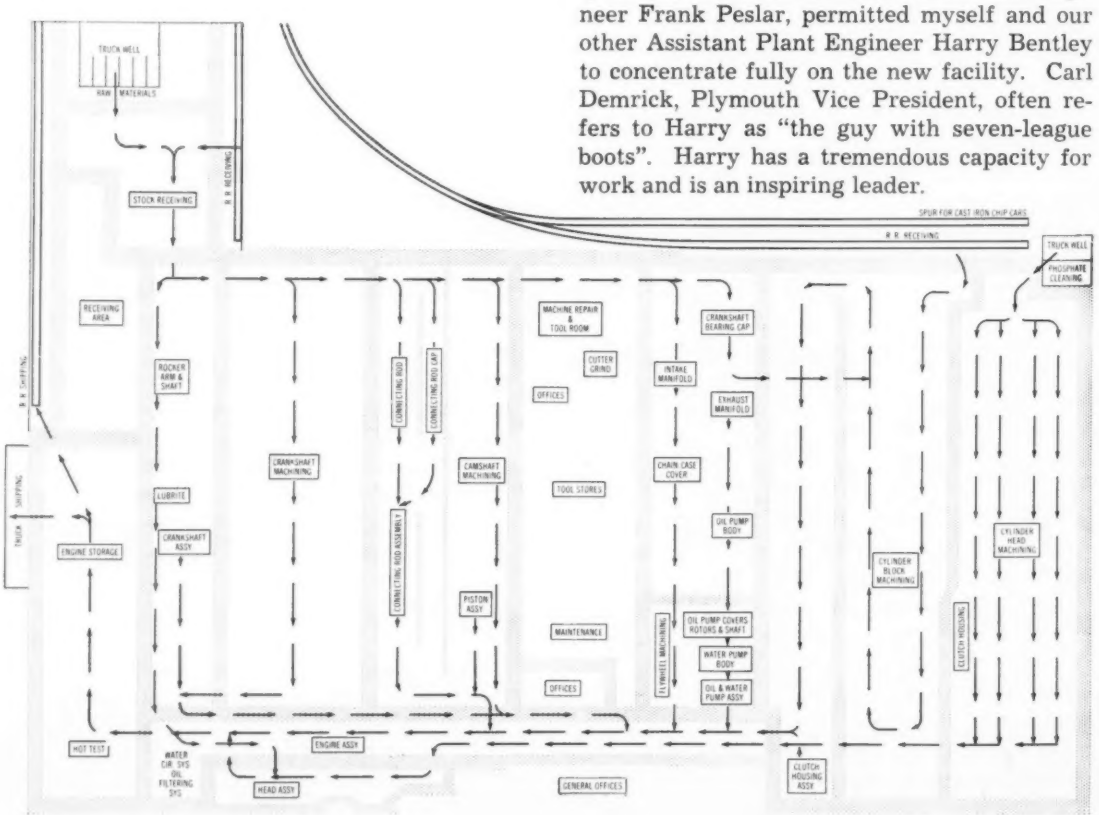


by William H. Allen
Plant Engineer
PLYMOUTH DIVISION
Chrysler Corporation

FOR THE PLYMOUTH V-8 ENGINE to be built by the most modern and efficient methods conceivable, a suitable plant structure was required. To provide a modern plant and have it in operation within little over a year looked like a formidable task . . . and was. To engineer and incorporate such innovations as a central coolant system and the elimination of stockpiling didn't at all simplify the task.

Credit for Plant Engineering's successful fulfillment of the assignment belongs to no single individual or group. First of all, the very positive requirements established by the Master Mechanic and his staff permitted us to progress without any hesitation and without any redoing. Secondly, we had developed a team of men who were capable of meeting the challenge.

Being able to leave the "six" plant entirely in the hands of our Assistant Plant Engineer Frank Peslar, permitted myself and our other Assistant Plant Engineer Harry Bentley to concentrate fully on the new facility. Carl Demrick, Plymouth Vice President, often refers to Harry as "the guy with seven-league boots". Harry has a tremendous capacity for work and is an inspiring leader.



Plant Engineering entered the V-8 engine plant program during the summer of 1954 — roughly one year prior to when we would need completed engines off the production lines. As the Master Mechanic's group completed operation sheets for the various engine parts, we'd begin analysis of them for machine layout, space requirements, power needed, and so on.

Actually we had a three-man group — Ray McCarroll, the Master Mechanic; Jack Ondrus, in charge of Budget & Time Study; and myself. We took about two engine parts a week, meeting regularly. Ray would explain how the part would be processed, the type of machine involved, how the part would be transferred and positioned and clamped. We in Plant Engineering had the picture of materials handling needs and service requirements. Jack was able to work out his time studies, his cycling program, his manpower requirements.

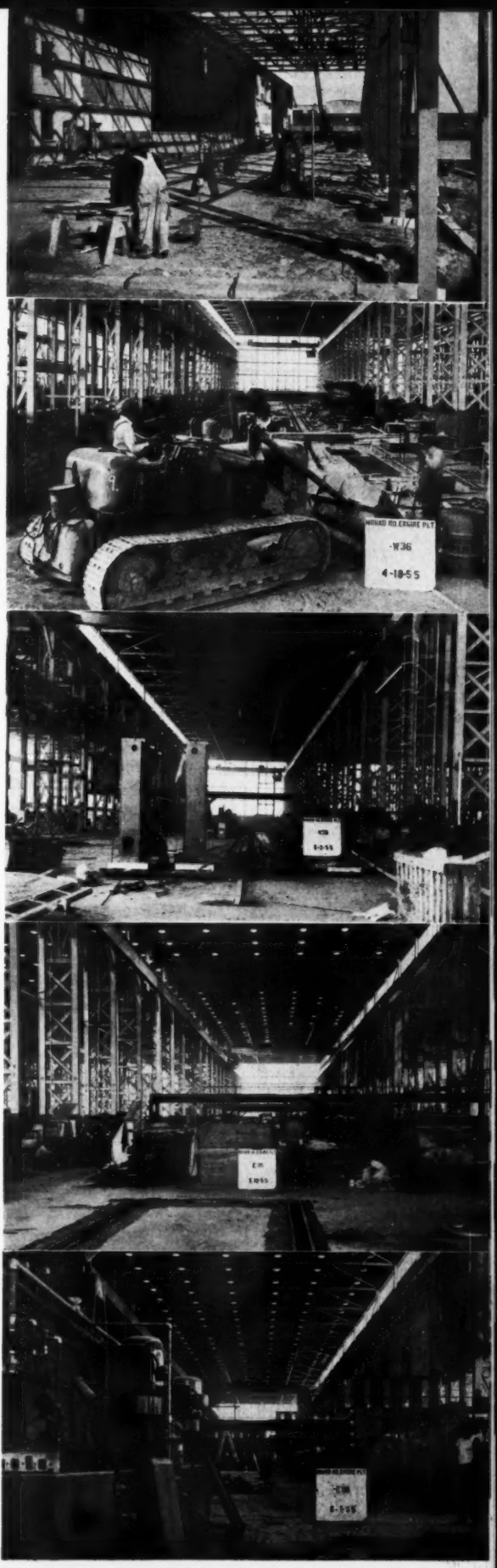
During this period we located a plant facility and began to figure how we would fit all this equipment into it, what building additions were needed, and set up a construction timetable. With the Master Mechanic and Time Study groups, we established departments so that costs could be properly allocated.

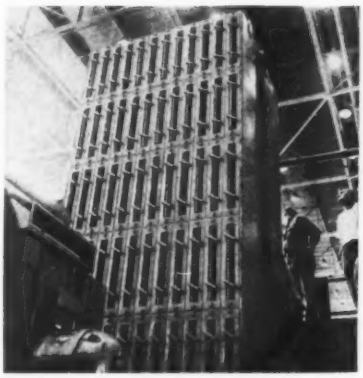
We figured space requirements on the basis of tentative block layouts of the individual production lines. As machine tool orders were placed and vendors came back with more complete data, the layouts were detailed. Working with the Master Mechanic's group, we determined the type of "automation" required between machines, what automatic wash units would have to be provided, as well as other services.

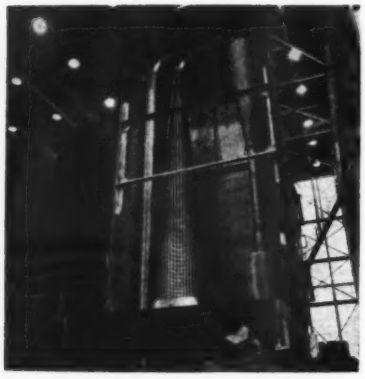
Time being a critical factor, we acquired a plant on Mound Road, Detroit, from Chrysler Corporation. It had been used for production of aircraft parts, but requirements had tapered off to where the project could be incorporated at the Chrysler jet engine plant.

We didn't step into this plant until January of this year. And then we still had to move out aircraft parts and aircraft tooling while beginning to remodel and expand the plant.

To completely house the four cylinder head lines and the two block lines, we immediately began construction of a 31,000 sq. ft. addition to the high crane bay area on the south end. This took 5 months to build, and we were installing machines before it was completed. At the northeast end we added an extension of about 40,000 sq. ft. to house our Receiving and General Stores areas. This took 4½ months to build.







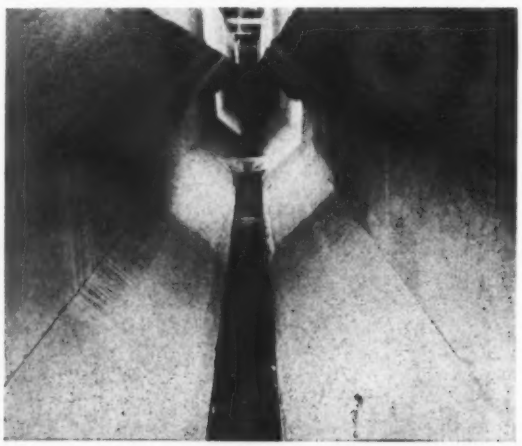
Aerodyne dust collectors located in cast iron machining areas move air at the rate of 10,000 cfpm, per unit. Downdraft ventilation system sucks dustladen air down through machines and through underfloor tunnels to the aerodyne units that filter the air and return it into the room cleaner than outside air.

We were digging dirt for only two months before Production came into the program. In one two-month period, we ran a cement company right out of cement. Construction began January 24 and was completed July 19. During this same period much of the production equipment was installed.

We had to virtually tear up the floor in order to install all the services required. It had been decided that all chips, dust, coolant, sludge . . . everything would be pulled down through the machines. Production machines straddle trenches, and waste is taken down through the machines. On the head and block lines, idle stations are provided between working stations. Here air blasts are used to help clean off chips and dust, blowing them down through the "funnel" machine base.

On cast iron production, a "ventilation" system pulls dust down. Experiments made at the old "six" plant proved that it is easier to take dust down than up. We have 61 ventilators, aerodyne dry type dust collectors, moving about 610,000 cfpm of air through the machines and trenches. The air is filtered and returned into the room area cleaner than outside air. This is a major achievement in plant housekeeping as well as employee health protection.

A total of 28 separate chip conveyors service the cast iron lines, feeding into a cross conveyor. The latter elevates and feeds chips into a 120-ton hopper. The hopper feeds directly into gondola cars. Chip conveyors are of the chain, drag type.



Below-floor chip conveyors are part of a completely automatic disposal system that entirely eliminates cleaning chips or sludge from individual machines.

Steel chip and coolant disposal is handled through a separate flume system that can move 12,000 gpm. This system leads into the yard where chips are drained and baled. The same flumeways are used to carry coolant to the machines. Pipes suspended near the top of the trenches carry soluble oil and water to the machines, where they are mixed as needed. This is believed to be the largest and most completely automatic, centralized coolant system in the country.

Machines are absolutely clear overhead, except for electrical conduits, lighting, and overhead conveyors. All pipes are underfloor, and trenches are covered with removable plates so as to permit ready access at all times.

Underfloor waste-removal systems have greatly improved general plant housekeeping. Hand-cleaning of chips and sludge from individual machines is now a thing of the past. Another big contribution to good housekeeping is the plantwide practice of mounting all independent hydraulic units off the floor and over drip pans.

Machines have been installed with a shoehorn. Where possible, one machine feeds directly into the next. Otherwise, materials handling device are employed to shorten the distance between machines or machine sections and tie them together. An outstanding example of this is in the crankshaft department. Crankshaft production has long been a major problem and a bottleneck to automotive engine builders. The machine tools do a job, but the crankshaft itself is so awkward to

handle as to resist automatic handling, and so heavy and cumbersome as to slow up manual handling and endanger operators.

Plant Engineering worked with the Master Mechanics and with a leading supplier of "automation" in the development of a complete, automatic crankshaft-handling system 4,000′ long. Only three manual handling operations remain. The key to success in this project was development of a "walking beam" type transfer. Briefly, the crankshaft comes to rest at each station on a pair of permanently positioned work rests. A transfer device picks up shafts from a number of stations and "walks" each of them to the next station.

The general dimensions of the plant are 500′ in width x 980′ in length and with the "L" extension constitutes 534,059 sq. ft. of floor area. We feed everything from the back of the plant toward the front. A rail siding brings cylinder block castings right to the head of the block line. A general Receiving area (200′ x 200′) includes 9 truck wells and 2 rail sidings — one for shipping and one for receiving. Jitneys, or lift trucks, move castings or forgings to the head of each line. There is very little standing inventory; the plant is a programmed receiving plant. Castings and forgings come in on a regular schedule to meet current needs.

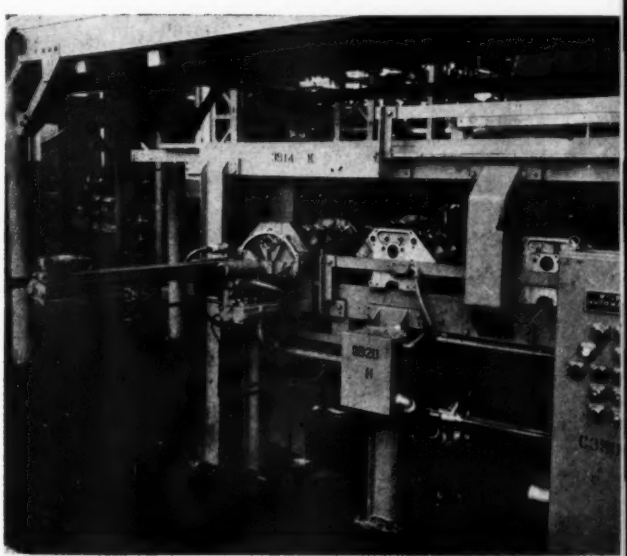
Individual parts production lines run from East to West, feeding the final assembly line which runs from South to North. All parts are moved from production line to assembly line by cycle-programmed overhead monorail conveyors . . . about 5 miles of them. Jitney or lift truck traffic has been just about eliminated, 9 jitneys now suffice and these operate in limited areas. This virtual elimination of motorized floor traffic is an important factor in plant safety.

HARRY BENTLEY
Asst. Plant Engineer
"the guy with seven-league boots"

ROBERT PATTERSON
Project Engineer
"he perfected the small parts kit"

Another achievement by Plant Engineering has been the development of a system for automatically assembling miscellaneous small parts into kits and delivering them to the final engine assembly line. Each kit carries the exact number of parts required for a series of operations on a single engine. This minimizes the possibility of parts not being installed as needed. It eliminates all need for stockpiling and jitney traffic at the assembly line.

Plant Engineering worked with Planning on the procedure for shipping completed engines. At this plant we are building a "bobtail", or base engine — that is, less transmission, carburetor, generator, starter, fuel pump. The reason was to eliminate back haul on these parts; it is far more economical to ship these parts directly to the assembly plants. Further-

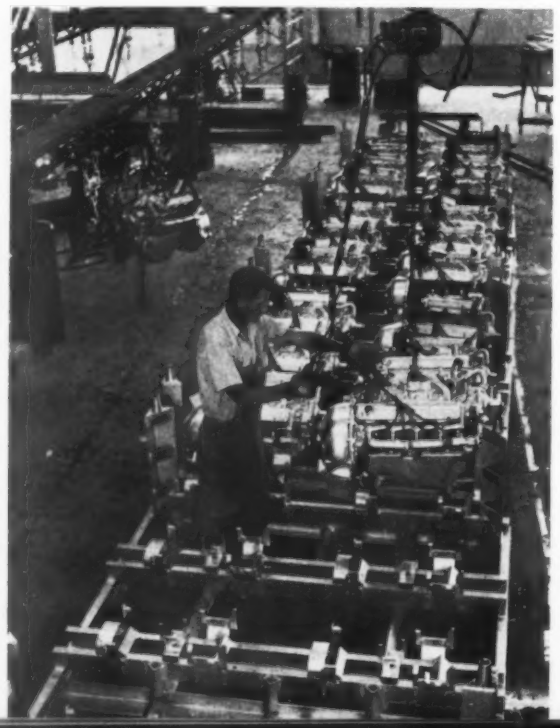


Plant engineering specified "automation" for moving work between major sections, around corners, or from one line to another. Objectives were to provide continuous flow of work, eliminate stock-piling, and avoid employee fatigue and injury.

Intricate network of overhead conveyor systems, supplied by Jervis B. Webb Co. and others, virtually eliminates floor traffic for movement of materials and parts between departments.

more, lack of these engine accessories saves unit storage height and eliminates the possibility of bent generator brackets, cracked distributors, etc. The quality delivered is known; there is no worry about damage in transit.

The "bobtail" V-8 engine weighs close to 600 lbs. Engines successfully passing the "hot test" are loaded onto shipping racks six to a rack. These racks were specially designed by Plant Engineering to simplify handling and transport. A loaded rack weighs 4600 lbs max.



Racks for truck or rail transport of Plymouth V-8 engines are designed to nest one on top of the other and to afford complete protection to engines in transit.

A 10,000-lb lift truck with power steering moves shipping racks into specially-fitted truck or freight car. A freight car will hold 21 racks, or 126 engines, destined for Evansville or Los Angeles, and can be loaded in about 15 min. Conventional practice of loading engines one at a time required about 3 hrs. A truck trailer will hold 8 racks, or 48 engines, for transport to an assembly plant within the city, and can be loaded in 3 to 5 mins. Production of 150 engines/hr requires fast handling.

The shipping rack is designed so that each engine fits into a "hanger" that prevents its contact with any other engine and prevents its movement. Racks can be stacked, one on top of another, without any possible damage to the engines. Within a freight car, legs of the bottom rack fit into reinforced wells that support the weight. Legs of higher racks are constructed so as to mate with the upper ends of legs on the rack below. Each rack has trunnions that ride on side rails to locate in notches locking it in position and preventing its shifting.

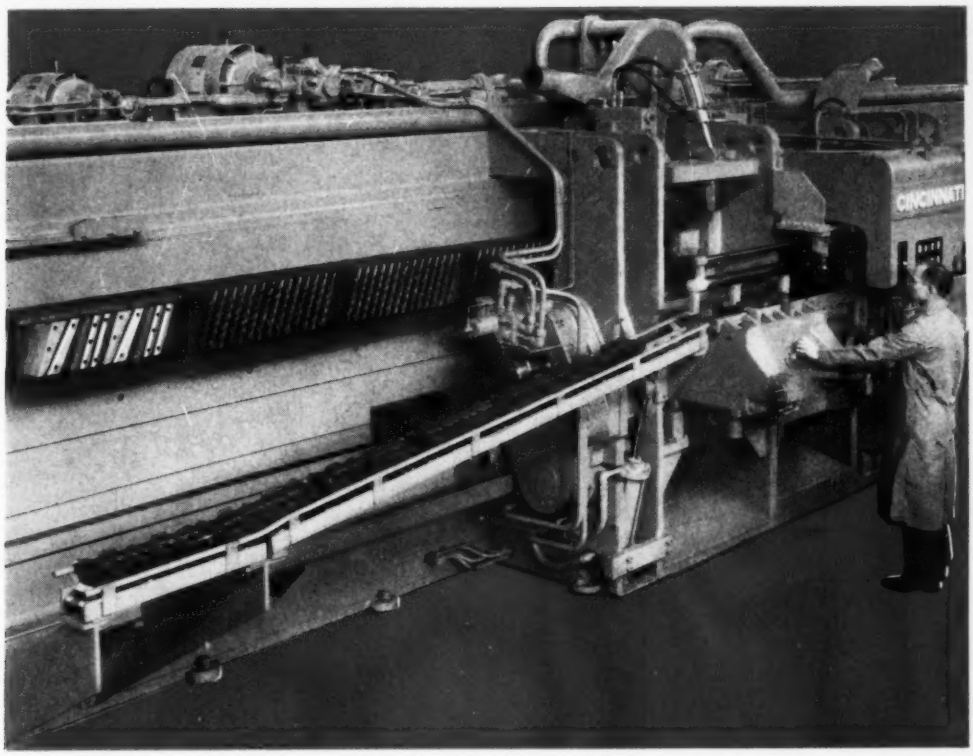
Here, as in other areas, Plant Engineering has contributed its share in building a safe and efficient plant for production of a quality V-8 engine.

BROACH

Double-Action Cincinnati

BROACH

Broaches 150 Cylinder Heads per Hour



Within the past few years spectacular progress has been made in the design and cost-reducing potential of machine tools. For example, consider the cost savings now possible in the machining of cylinder blocks and heads.

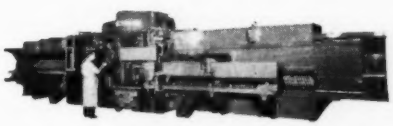
Today, CINCINNATI Horizontal High Speed Surface Broaching Machines are producing 2½ times faster than comparable equipment a few years old, and tool life per unit has increased 25 times!

While these cost savings are more spectacular than might be realized in the production of smaller parts, they are indicative of the big strides made by Cincinnati Milling in reducing costs through the application of modern broaching techniques. Remember this: Cincinnati's broaching experience dates back more than 20 years . . . Cincinnati was first in developing many present-day broaching concepts such as electro-mechanical drive . . . Cincinnati builds a complete line of horizontal and vertical broaching machines, including large special broaches built to your specifications. Would you like to have a picture-book review and brief specifications of CINCINNATI Horizontal Broaching Machines? Write for catalog No. M-1910.

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

PRODUCTION DATA

Surfaces broached	*top, joint, intake and exhaust faces*
Cutting speed	*150 feet per minute*
Stock removal	*3/16" (½ ton per hour)*
Production	*150 heads per hour*



CINCINNATI 22-foot stroke, Two-Way Horizontal Broaching Machine, tooled up and conveyorized to broach cylinder heads.

CINCINNATI

CINCINNATI

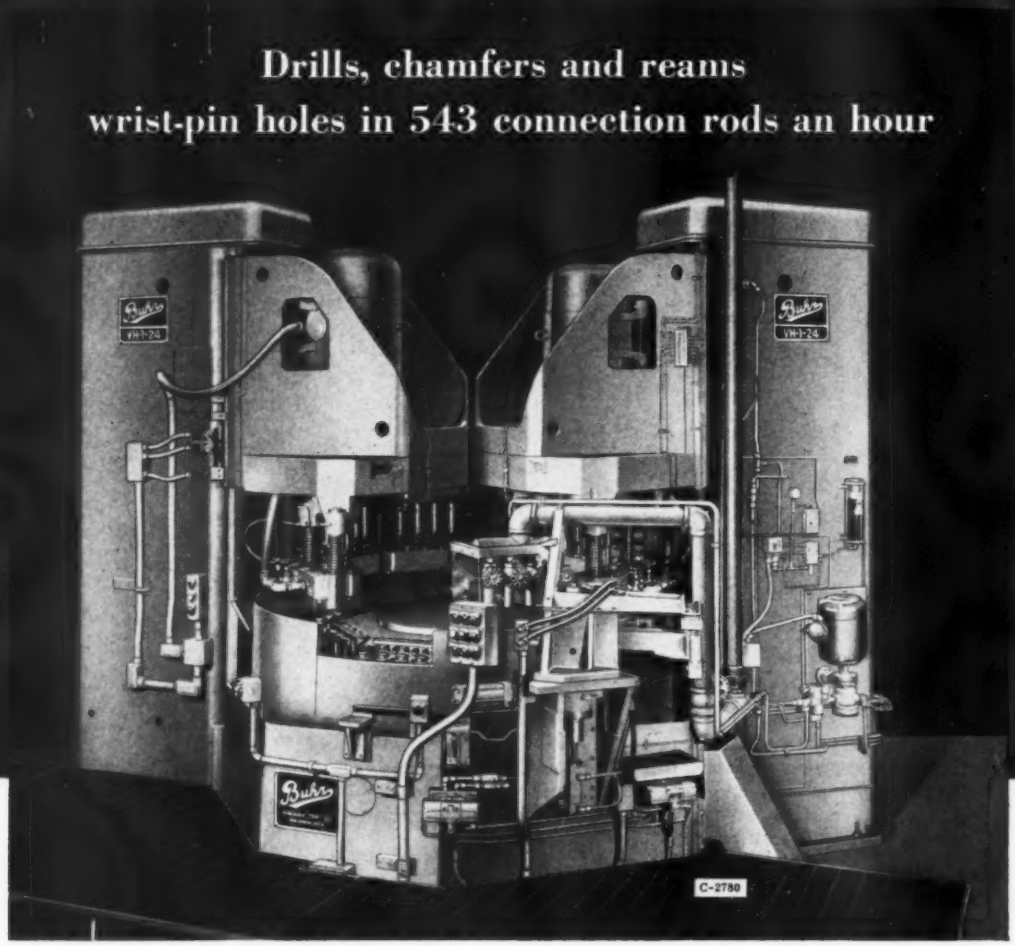
MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

CIRCLE INFORM-A-GRAM KEY NO. 1051

ANOTHER EXAMPLE of

Buhr ECONOMATION

Drills, chamfers and reams wrist-pin holes in 543 connection rods an hour



This 8-station 2-column Buhr Economatic, which features automatic unloading of parts, processes connecting rods in this manner—

Station 1—load 4 parts . . . Station 2—drill (4) $^{55}/_{64}$″-wrist-pin holes 1/3 through . . . Station 3—drill (4) $^{27}/_{32}$″-holes 2/3 through . . . Station 4—drill (4) $^{53}/_{64}$″-holes through . . . Station 5—coredrill (4) $^{31}/_{32}$″-holes through . . . Station 6—20°-chamfer both ends of (4) holes . . . Station 7—1.001″-ream through (4) holes . . . Station 8—unload parts automatically onto conveyor.

Besides automatic unloading, this Buhr Economatic features a 72″-diameter Buhr Powerflo index table, and automatic clamping and chip removal.

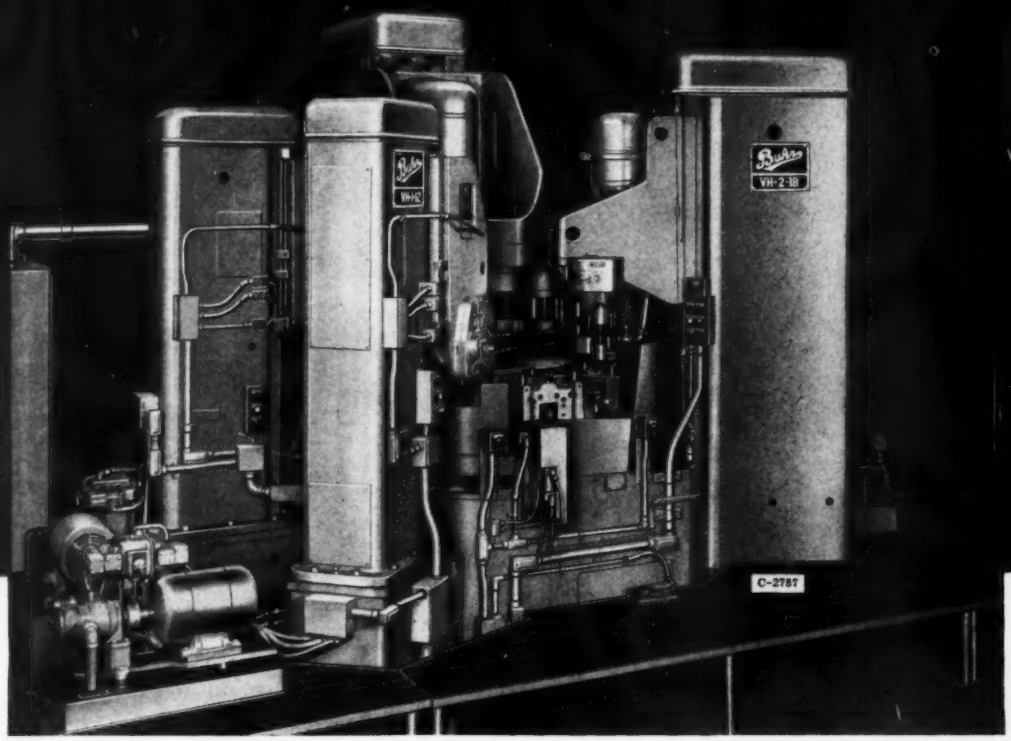
Buhr

MULTIPLE-SPINDLE HIGH PRODUCTION MACHINERY

Find out how Buhr Economation will reduce your production costs. A phone call, wire or letter will bring you a prompt consultation with one of our top sales executives.

Two of the many Buhr Economatics, including transfer machines, used in the production of 1956 V-8 automobile engines!

Drills, chamfers and reams (2) bolt holes, and mills and chamfers bearing notches in 600 connecting rods an hour



This 8-station 4-column Buhr Economatic, featuring two angular mill units, performs operations on connecting rods as follows—

Station 1—load and unload 4 parts . . . Station 2—mill bearing notch in (4) parts . . . Station 3—chamfer bearing notch in (4) parts . . . Station 4—drill (8) $^{23}/_{64}$″-holes 1/2 through . . . Station 5—chamfer (8) holes . . . Station 6—drill (8) $^{23}/_{64}$″-holes through . . . Station 7—rough-ream (8) $^{3}/_{8}$″-holes . . . Station 8— finish-ream (8) .390″-holes.

Features of this Buhr Economatic, other than the two angular mill units, include a 60″-diameter Buhr Powerflo index table, automatic clamping and manually-operated part ejector.

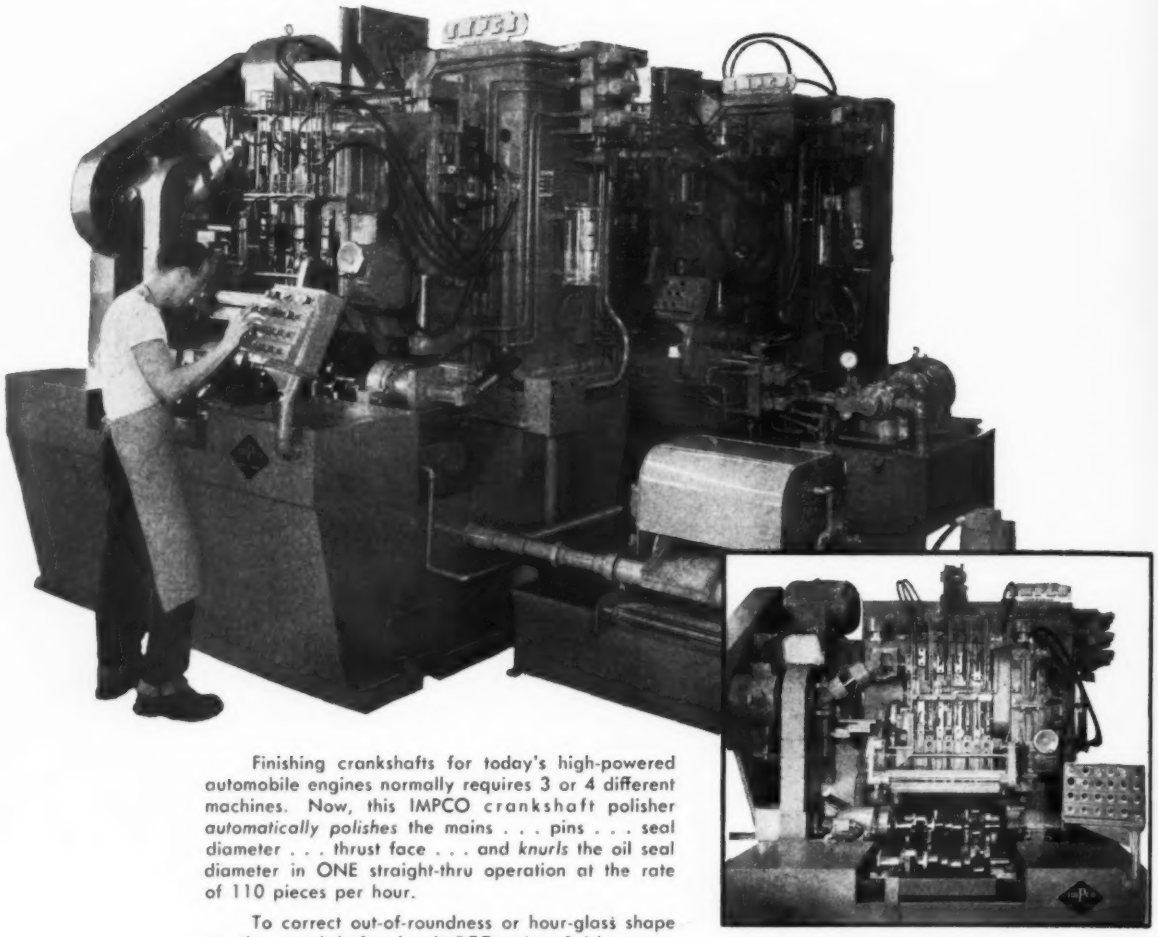
BUHR MACHINE TOOL COMPANY©

ANN ARBOR, MICHIGAN

Solidly Engineered • Precision Built • for World's Leading Manufacturers

New IMPCO 9 Station

TRANSFER-TYPE POLISHING MACHINE



Finishing crankshafts for today's high-powered automobile engines normally requires 3 or 4 different machines. Now, this IMPCO crankshaft polisher *automatically polishes* the mains . . . pins . . . seal diameter . . . thrust face . . . and *knurls* the oil seal diameter in ONE straight-thru operation at the rate of 110 pieces per hour.

To correct out-of-roundness or hour-glass shape on the crankshaft, the IMPCO micro-finisher uses emery cloth in precision shoes, which are actuated by two master crankshafts, timed with the part.

New cloth is automatically fed to the shoes for each cycle. Used cloth is automatically re-wound for disposal. All polishing is done under a spray of coolant. The machine is completely hydraulic, uses a walking beam-type transfer system. Lubrication is completely automatic.

Why not find out how IMPCO engineers can help you cut costs? Write today. Your own production problems will receive expert attention.

Close-up view of crankshafts entering loading station.

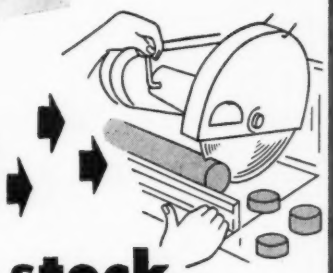
IMPCO

INDUSTRIAL METAL PRODUCTS CORPORATION

Builders of IMPCO Straighteners, the American HEB Pilot Lathe, and Special Machinery

3417 W. ST. JOSEPH STREET LANSING, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1081



first to offer

carbide bar stock cut to length

Now you can buy super hard **Talide Bar Stock** in bars, strips or rods; in standardized sizes from 1/16" square to ¼" x ¾" rectangular; tubes 1/16" to ⅜" O. D.; rods 1/16" to ½" diameter . . . IN ANY LENGTH. Complete stocks are available at these warehouses:

Newark, N. J. . . . . 166 Bloomfield Ave.
Detroit, Mich. . . . . 20485 Van Dyke
Youngstown, O. . . . . 107 E. Indianola Ave.
Chicago, Ill. . . . . 4244 W. Diversey Ave.

Metal Carbides stocks 1325 different sizes of standard, solid Talide Metal in bars, strips, rods, tubes, bushings, rings, flats, tips and discs for immediate shipment. Special shapes furnished up to 25" O.D. in any length and up to 5000 lbs. per piece by weight —for every die and wear part application.

• Metal Carbides produces only top quality metal in latest type vacuum furnaces. From ore to finished product, all operations are rigidly controlled in our new multi-million dollar plant of over 100,000 sq. ft. Write for Catalog 55-G. Metal Carbides Corporation, Youngstown 7, Ohio.

Only Metal Carbides Produces both Sintered and Hot Pressed Carbides

METAL CARBIDES CORPORATION
TALIDE®
YOUNGSTOWN 7, OHIO

HOT PRESSED AND SINTERED CARBIDES · VACUUM METALS
HEAVY METAL · CERMETS · HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

CIRCLE INFORM-A-GRAM KEY NO. 1091

MANUFACTURING MEMOS

Research Expansion . . .

● In the search for materials that can withstand high temperatures of sustained supersonic flight, Marquardt Aircraft Company is expanding its ceramic and cermet research and development program. The company wants to find materials that will withstand 1200 to 2400° F heat.

New Chairman . . .

● The new chairman of the Technical Committee of the Abrasive Grain Association is F. Paul Ronca, who is with The Carborundum Company. The Committee standardizes grain size and technical specifications relating to the production of abrasive grain.

Distributors Named . . .

● Schroeder Brothers in Pittsburgh will represent Rivett Lathe & Grinder, Inc. of Boston, in the western Pennsylvania and West Virginia area. The firm will distribute the Rivett line of air and hydraulic valves, and cylinders and power units.

● Three new distributors of Vascoloy-Ramet products have been named. They are Empire Tool Engineering Company, Ariz.; Cameron Tool & Supply Company, W. Va.; and Precision Tool and Engineering Corporation, Pa.

● The Gear Grinding Machine Company of Detroit has appointed two distributors for their recently developed single spindle automatic screw machine, the "Detroit Screwmatic 750". American Cam Company, Inc., Hartford, Conn., will serve the New England area. Metropolitan New York; Fairchild County, Conn.; New Jersey; and Pennsylvania, will be covered by Guthery Machine Tool Corporation, Long Island City, N. Y.

● A Cleveland firm, Die Supply Company, Division of E. W. Bliss Company, has been appointed as an industrial distributor for the Barrymount line of machinery mounts. The announcement was made by Barry Controls Inc. of Watertown, Mass.

● A branch office of Syracuse Supply Company was recently designated an authorized distributor by Carboloy Department of General Electric Company.

● Walworth Company, 113-year-old manufacturer of valves and fittings, has purchased the M & H Valve and Fittings Company of Anniston, Ala. M & H produces and distributes valves and hydrants for water companies, filtration and sewer disposal systems, fire protection systems, and industrial plants.

Bogue Electric Manufacturing Company, Paterson, N. J., has merged with two former subsidiaries, Belco Industrial Equipment Division, Inc., and HomEase Products Division, Inc. In addition, four related firms have been acquired as subsidiaries. The company will manufacture and make available for the first time in the United States, a new type of variable speed AC motor. This motor bypasses previous types by completely eliminating all gears and mechanical means of power transmission.

Responsibility for commercial development of the process for manufacturing man-made diamonds has been assigned to Carboloy Department of General Electric Company in Detroit.

A new firm, Punch Products Corporation of Niagara Falls, N. Y., has been formed. It's headed by seven former executives and personnel from Wales-Strippit Corporation. The company will manufacture "Unitized" hole punching and notching equipment.

The research efforts of The Reliable Spring & Wire Forms Company of Cleveland, are being directed toward reducing the cost of manufacturing extension and torsion springs with complicated ends, and close-tolerance compression springs. The company recognizes that the mechanical spring industry is becoming more specialized each year with the development of many completely automatic mechanical devices in which springs supply or control force.

The Heald Machine Company of Massachusetts has been purchased by The Cincinnati Milling Machine Company. Heald manufactures precision boring machines, internal grinders, and rotary table surface grinders.

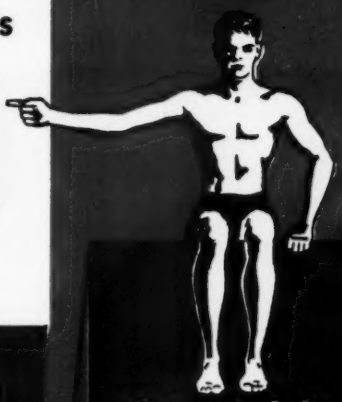
The F. Jos. Lamb Company is expanding in the field of special machines, automation equipment, and related products. One of the Detroit firm's unique products is an automatic small parts vertical storage unit to be used in automating a line of standard machines.

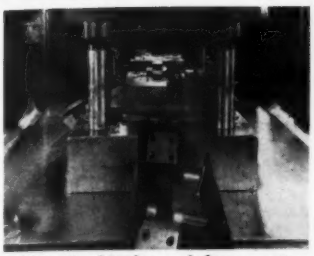
The merger of Harrisburg Steel Corporation with Precision Castings Company was made known by J. T. Simpson and W. J. During, presidents. The firm is a prominent name in the production of high pressure cylindrical containers for compressed gases, forgings, flanges, and pipeline industry fittings.

Leading hardware manufacturer prefers

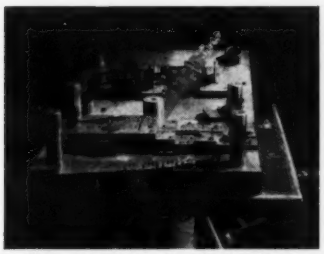
Olympic FM

DIE STEEL for long run dies

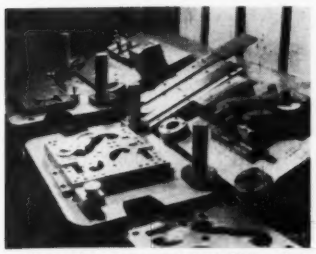




This die blanks and forms automotive door hinges of curled type from 5/16" steel. Production over 1,000,000 hinges yearly.



This progressive die blanks, pierces, and forms a new patented barrel bolt and keeper from 1/16" steel.



Braces for ornamental shelf bracket is blanked from .143" full hard 1010 steel that has been given a forged iron finish.

Millions of butt hinges per year are blanked out on this die. Metal thickness is 1/8".

For typical die applications such as these, McKinney Manufacturing Co., Pittsburgh, Pa. selects Olympic FM

because of:

1. Reduced machining time
2. Increased tool life
3. Better finish . . . does not tear

McKinney Mfg. Co., manufacturer of hinges and builders' hardware since 1865, is one of many die users who prefer the long-run performance characteristics of Latrobe's Olympic FM high carbon-high chromium die steel. These performance advantages, together with economical machinability factors are the result of Latrobe's DESEGATIZED® process of manufacture where the carbide particles and the alloy sulphides are uniformly dispersed throughout the steel.

Order Olympic FM for your next die . . . over 250 stocked sizes readily available from ten conveniently located warehouses.

LATROBE STEEL COMPANY

Main Office and Plant
LATROBE, PENNSYLVANIA

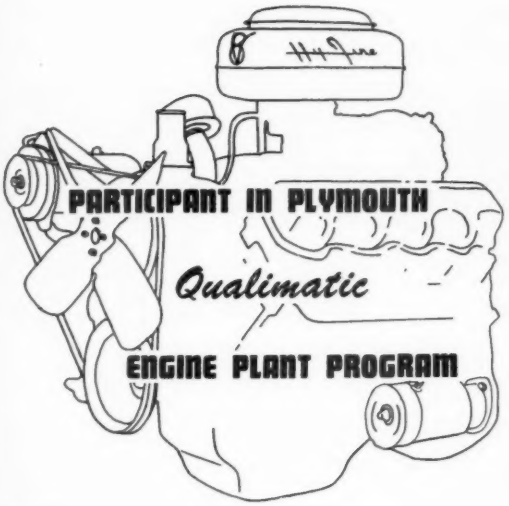
Branch Offices and Warehouses in Principal Cities

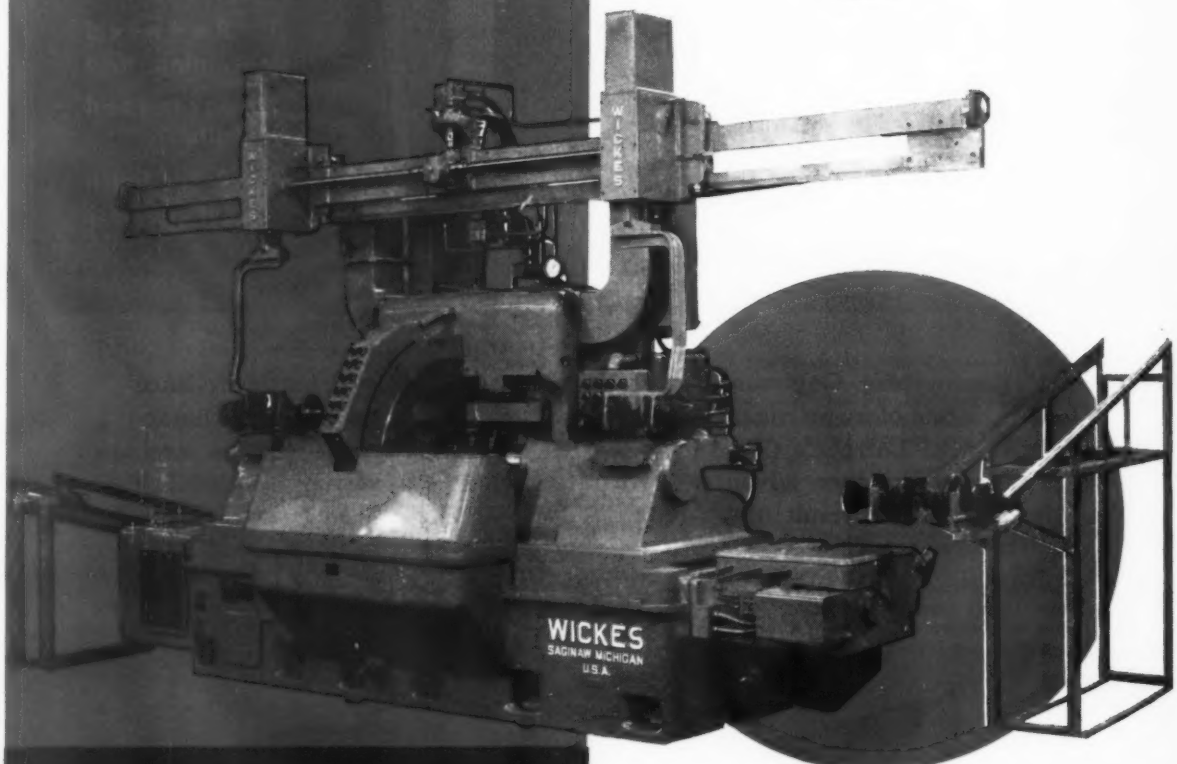
WICKES

CENTER DRIVE CRANKSHAFT LATHES

TOPS IN PRODUCTION PERFORMANCE

$2\frac{4}{10}$ minutes floor to floor on steel forgings





WICKES

100 YEARS' EXPERIENCE IN SOLVING PRODUCTION PROBLEMS

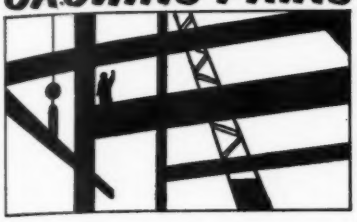
88

BROTHERS • SAGINAW, MICHIGAN

DIVISION OF THE WICKES CORPORATION

CIRCLE INFORM-A-GRAM KEY NO. 1121

GROWING PAINS



Tube Reducing Corporation has added 1000 sq. ft. of production area to manufacture a new type of cold finished tubing. The new facilities will turn out more than several million feet of the tubing per month. The "Rockdrawn" tubing will be produced by a unique process combining cold compression rolling and cold drawing.

Baker Brothers, Inc. of Toledo, has opened a Sales and Engineering Division in Detroit to coordinate operations with its representative, **The Motch & Merryweather Machining Company.** Baker manufactures standard and special machinery for drilling, boring, and tapping.

Ford Motor Company will build a Scientific Laboratory and Research Building in Dearborn, Mich., as part of a new advance design and product research program. The multi-million-dollar expansion providing more than 300,000 sq. ft. of floor space, will be completed in 1957.

George L. Nankervis Company has purchased a 72,000 sq. ft. plant in Detroit formerly occupied by Nash Division of **American Motors Corporation.** A 12,000 sq. ft. addition to house executive and general offices and an engineering drafting room is being planned. The new plant's floor space will double the amount now available to the company.

Federal Tool & Mfg. Company, producers of short run stampings for industry, is adding 9000 sq. ft. to its plant in Minneapolis, Minn. The addition will house new equipment, and increased loading dock and stock room facilities.

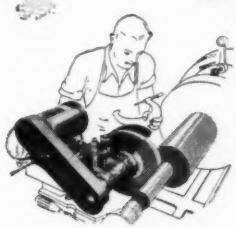
The new national headquarters for the **Pressed Metal Institute** has been opened at 3673 Lee Rd. in Cleveland, O. The building is a 30' x 50' one-story structure. Harold A. Daschner was recently appointed managing director of the Institute.

W. O. Barnes Company, Inc. has completed a 9000 sq. ft. addition to the Detroit plant to meet the increasing demand for Barnes band and hack saw blades.

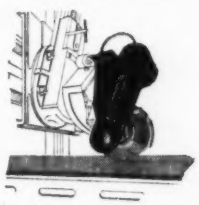
NEW!

DUMORE TOOL POST GRINDER turns standard machine tools into heavy-duty grinders

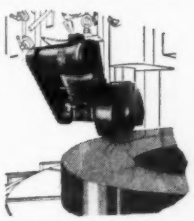
YOUR PRESENT EQUIPMENT PLUS A DUMORE "25" WILL CUT YOUR GRINDING COSTS ON THE BIG JOBS



MOUNTED ON LATHE



MOUNTED ON PLANE

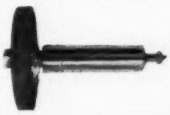


MOUNTED ON VERTICAL BORING MILL

Large external grinding jobs, which have been impractical or impossible for you to do in your own plant, can now be easily and economically handled on your existing machine tools. The answer is the new Dumore Series 25 Tool Post Grinder mounted on lathes, vertical boring mills, planers, shapers and other standard machine tools.

Size of the work is limited only by the machine tool itself. Mounted on a 20" or larger lathe, this powerful grinder will grind and finish all types of cylinder work such as textile and rubber printing press rollers. Motor and quill can even be turned end-for-end for back of lathe mounting. On a planer, the largest surface grinding jobs are done easily. And on a vertical boring mill, it saves hours of set-up and transfer time on normally difficult work.

The Dumore "25" is powered by a 3 H.P. induction motor that assures controlled wheel speed under the severest load conditions. Equipped with built-in magnetic starter, overload protector and greased sealed bearings. Rugged, cast iron frame built to withstand vibration. 12 inch wheel capacity.



THE FAMOUS DUMORE QUILL ... HEART OF THE GRINDER

Recognized throughout the industry for its precision. Equipped with Timken precision tapered roller bearings, grease-lubricated and pre-loaded at the factory having a radial capacity of 955 lbs. and a thrust capacity of 655 lbs. Swings wheel 12" x 1½" at 1750 rpm.

WRITE FOR BULLETIN 425
For Detailed Information On The New Dumore Series 25 Tool Post Grinder

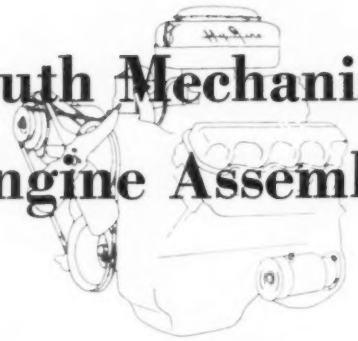
DUMORE®

AUTOMATIC DRILL UNITS
TOOL POST AND HAND GRINDERS

1304 Seventeenth St.
Racine,
Wisconsin

CIRCLE INFORM-A-GRAM KEY NO. 1131

Plymouth Mechanizes Its Final Engine Assembly Line



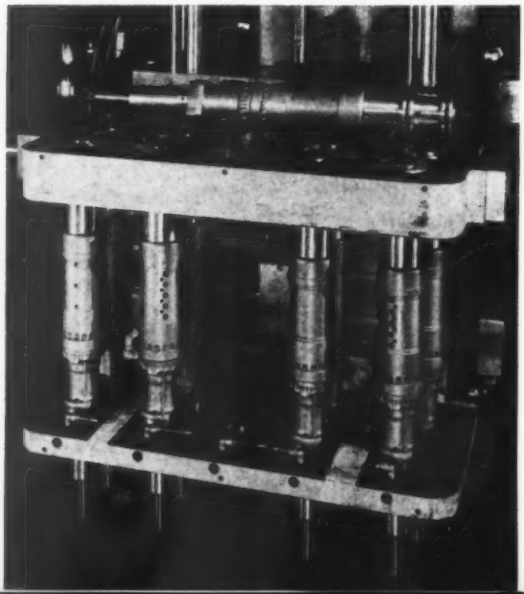
ONE OF THE MOST FASCINATING and most significant of the many remarkable innovations in the Plymouth "Qualimatic" V-8 engine plant is the mechanized final assembly of engines. This is completely new; you might even call it revolutionary.

In recent years, many assembly operations in automotive and aircraft plants have been individually mechanized; but, for the most part they have been merely pushbutton operations. The new Plymouth engine assembly line features completely automatic intermittent-transfer of engine from station to station and many fully automatic assembly operations. The primary benefits obtained are a higher quality product and decreased operator fatigue.

The Cross Transfermatic assembly line consists of a 565′ final assembly machine built in three sections, and two cylinder head assembly machines each 120′ long. These are actually machines in that there is a permanent machine base with work transferred automatically from station to station with a 16-second dwell time and an 8-second index time, providing for continuous output of 150 engines per hour.

At the beginning of the program, Plymouth engineers decided to turn to mechanized assembly of the engines for two primary reasons. Number one was to achieve a uniform specified torque on all bolts and nuts and to achieve this automatically without the possibility of human failure. As every car owner knows, it is essential that threaded fasteners be tight enough to eliminate leaks but not so tight as to warp or otherwise damage critical parts or contribute to short fatigue life of the fastener. The second and just as powerful a motivation was the desire to eliminate the critical factors of human fatigue and back-breaking labor from the final assembly line. No longer is it necessary for workers to move any great distance to bring stock to the line, or to lift heavy parts from one point to another. No longer will it be necessary for man to hold an impact wrench and buck its repeated shock hour after hour. Furthermore, this is a far safer line than any conventional engine assembly line.

To answer the requirements established by the Master Mechanic's group, this machine was built for the future; it was given the "Forward Look." Not all operations are being mechanized immediately. Some operations



Typical air motor mounting arrangement in multi-spindle nut runners. Replacement air motor laying across top of manifold shows ports around periphery of air motor adaptor for flow of air from manifold into the motor, thus permitting fast changing of motors.

are fully automatic; others remain manual. Some may never be made automatic. But at each station of the machine there are face plates on the machine base that are machined, ground and drilled accurately in relation to the pallet-locating pin for fast installation or removal of the work-performing modules — the actual operational units.

Some operations need to be performed from opposite sides of the line. At each station the machine base is cored and bored straight through from one side to the other so that opposed modules to be closely synchronized can be quickly wired through the machine base.

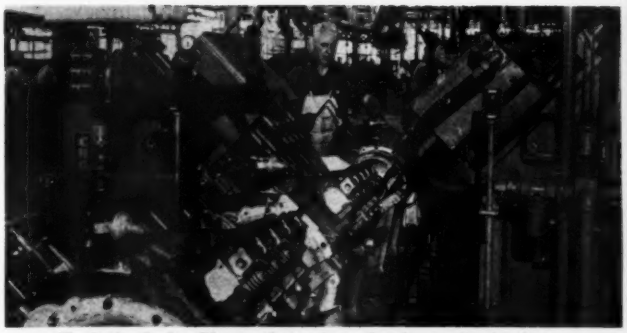
All operational units are air powered for reliability, safety, and simplicity. Each complete module is self-contained. It can be quickly removed or installed anywhere along the line with fast connection of electrical and air service lines.

At the beginning of the assembly line an overhead conveyor brings the cylinder block from the inspection unit at the end of the block line, and the block is positioned on a pallet that carries it through the machine. The engine is accurately located on the pallet by means of special locating pads provided in the design of the block casting at request of the Master Mechanic's group.

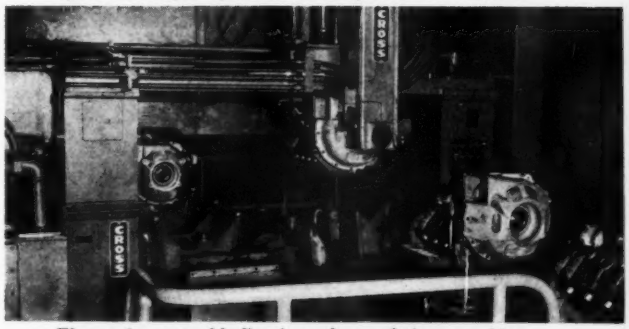
The pallets are indexed from station to station by a transfer bar that runs the length of the machine section. This bar is actuated by hydraulic cylinders. It is equipped with dogs that engage each pallet and pull it for a distance of 4′ to approximate position at the next station. A second bar moves through a short increment of travel to actuate a shot-pin that registers in a locating hole in the pallet and positions it longitudinally to within about 0.005″ accuracy. The long transfer bar then rotates 30° to disengage the dogs, and returns to position. The bars reciprocate on V-type rollers.

The transfer of pallets from station to station undergoes a slow acceleration and deceleration for operator safety. This is achieved by a special hydraulic valving arrangement. Thus, in the event that there are hand power tools being used on the line, the operator can safely finish his operation if incomplete at the time the machine starts to index.

The Cross machines can be described as being of the over-and-under intermittent-transfer type but have been designed for maximum flexibility. It will be a relatively simple matter to convert to either continuous transfer or fully manual operation.



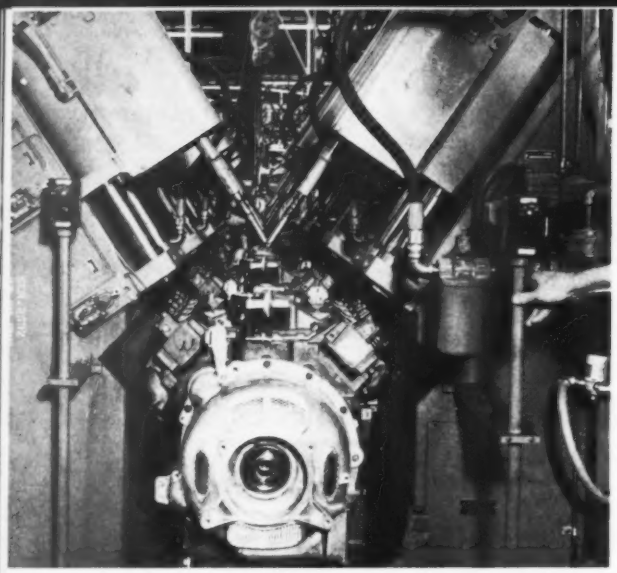
Typical of the Plymouth engine plant's mechanized assembly is the automatic tightening of head bolts to specified torque by these multi-spindle nut runners.



The engine assembly line is made up of three machine sections. This automatic transfer unit lifts a partially-assembled engine from the pallet in the last station of section 1 (at right), traverses with the engine, and lowers it onto the pallet in the first station of section 2.

Here, in section 2 of the assembly line, piston-and-connecting rod assemblies are manually installed into the engine and secured by caps and bolts. Bolts are then automatically tightened at the modular operational units shown farther along the line.

An automatic transfer unit lifts an engine from the end of section 2 and turns the engine back to normal position while transferring it onto the pallet in the first station of section 3.



Air-powered, multi-spindle nut runners automatically tighten engine manifold screws to specified torque as one of the last operations in the mechanized assembly of Plymouth V-8 engines.

The pallets are attached to a chain by which the pallets are returned from the final station to the beginning of the line, being conveyed through a tunnel beneath the machine base.

Many of those operations already made automatic involve tightening nuts or bolts to a certain prescribed torque. Automatic torqueing is done on each group of bolts by multi-spindle way-type heads. Thor air motors are used for such purposes throughout the line. These are equipped with a special adaptor of Cross design that fits them to the air manifold in the spindle head. Air is fed to the manifold and through the manifold into the various air motors assembled to it. This design was created for fast changing of air motors in order to minimize this possible source of downtime. Each motor can be adjusted as to the specific torque required. Motors are individually lubricated. The operating head is completely enclosed by insulated covers that cut the normal noise level in half.

It is interesting to note that only three types of Thor air motors are used throughout the line and that they perform more than fifteen distinct fastening operations. Only two or three threaded fasteners are currently being tightened by hand tools, because of their inaccessibility.

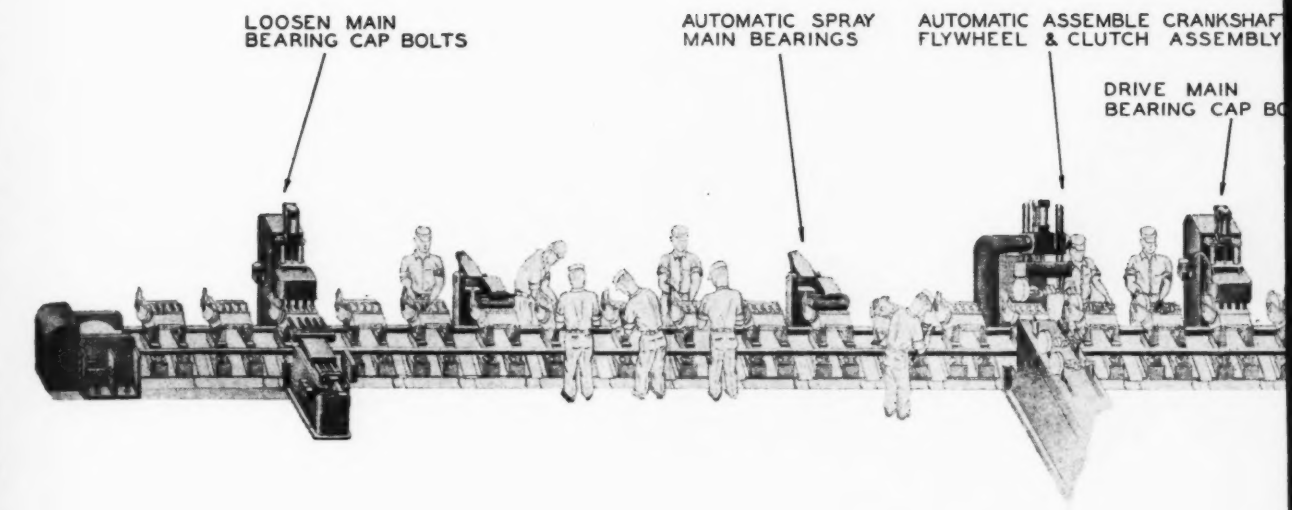
These assembly lines are "clean" lines. There is no stockpiling in the assembly area. All parts and sub-assemblies are brought to the line by conveyor, as needed. For example, all small parts needed for a single engine within a particular section of line are brought to the line in a plastic tray. Carried to the line by the Jervis B. Webb overhead conveyor system, these trays are color-coded to indicate what section of the line each tray is destined for. At the beginning of the line, the operator removes a tray designated for section 1 from the tray conveyor and places it between two cylinder blocks starting along the final assembly machine. At the completion of the assembly operations in section 1, the emptied tray is removed and placed in a "homeward bound" hanger on the overhead conveyor.

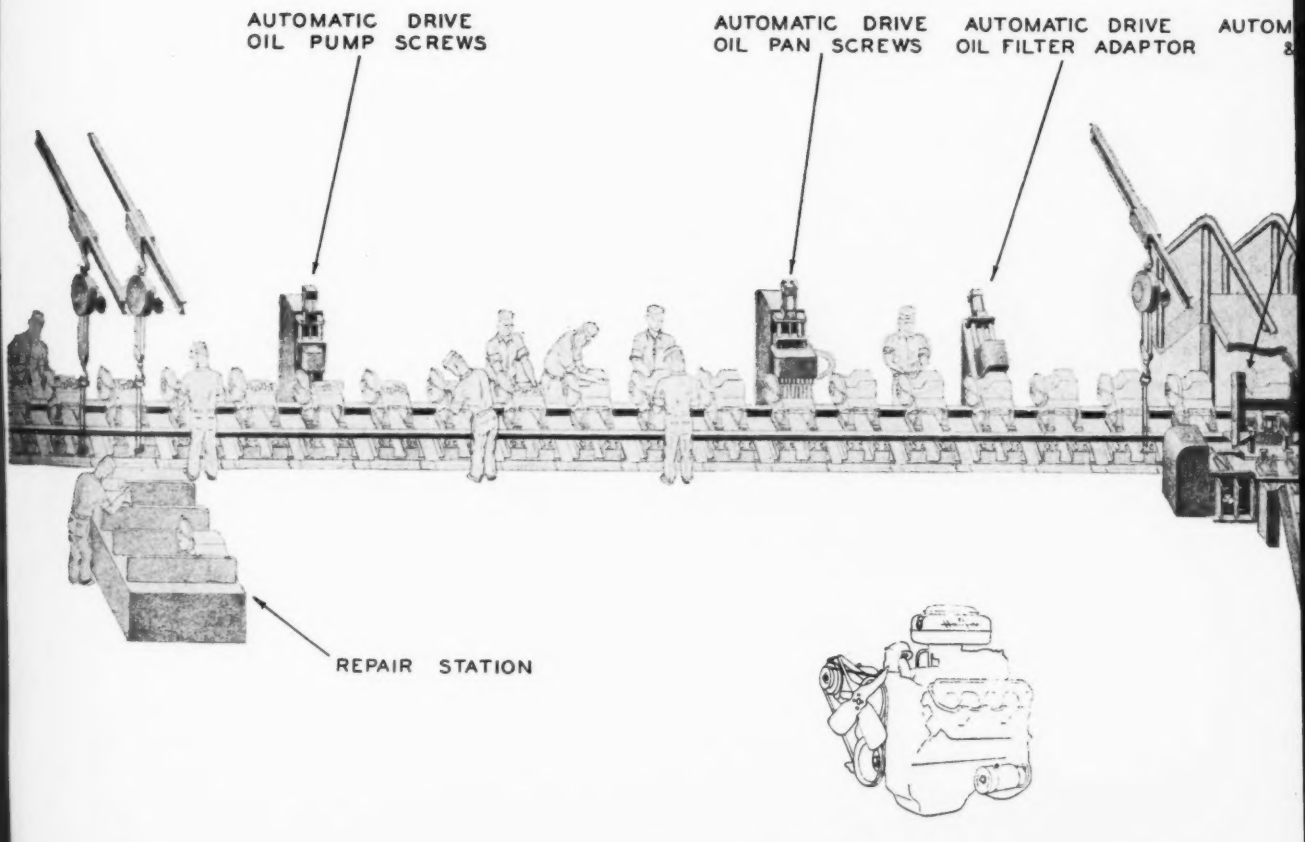
A special automatic unit lifts the engine from the end of section 1 and lowers it onto another pallet for its trip through section 2. The pistons to be installed are brought in matched sets by overhead conveyor, which descends and travels immediately over section 2 of the assembly machine. The overhead conveyor is synchronized with the assembly machine so that one set of pistons moves in unison with a particular engine on the line. This permits the pistons to be removed from the conveyor hanger one at a time and installed in matched sets without fail.

At the end of section 2, an automation device removes the engine from the last pallet of section 2 and inverts it in the process of positioning it in the first station of section 3.

The manner in which this Cross assembly line was engineered and built will permit continued mechanization of operations. It is even felt that eventually many small parts such as springs, threaded fasteners, washers, and the like can be made immediately adjacent to the line and fed automatically, directly into the station where it is required. It is very likely that this approach to mechanized assembly will have considerable impact upon the entire automotive industry.

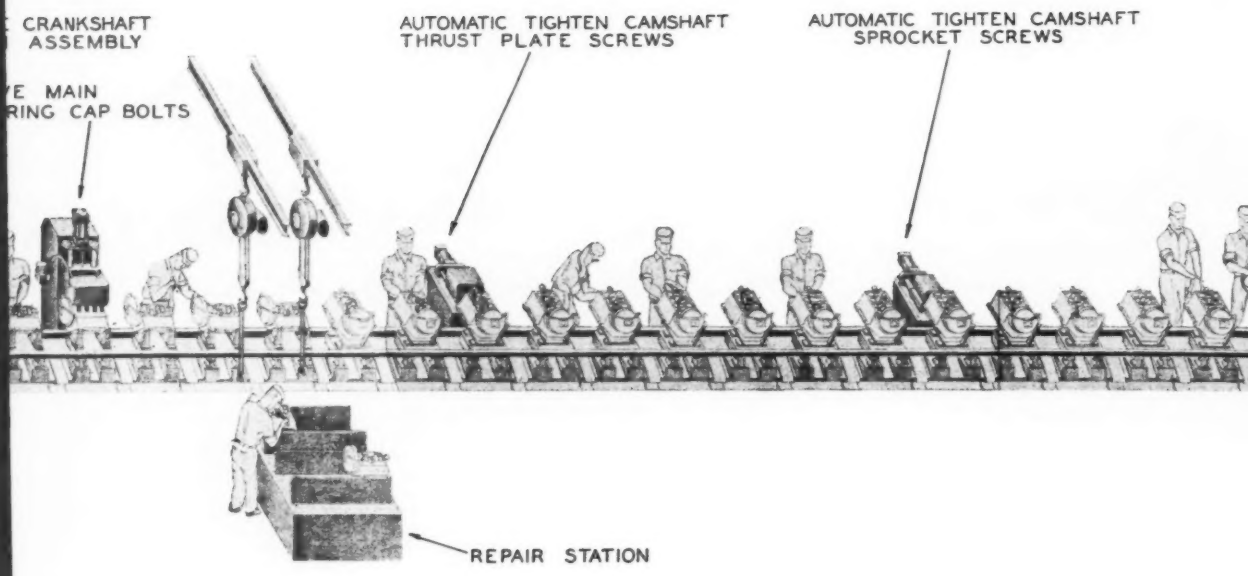
FOLDOUT SHOWS CONCEPT DRAWING OF THE PLYMOUTH MECHANIZED ENGINE ASSEMBLY.

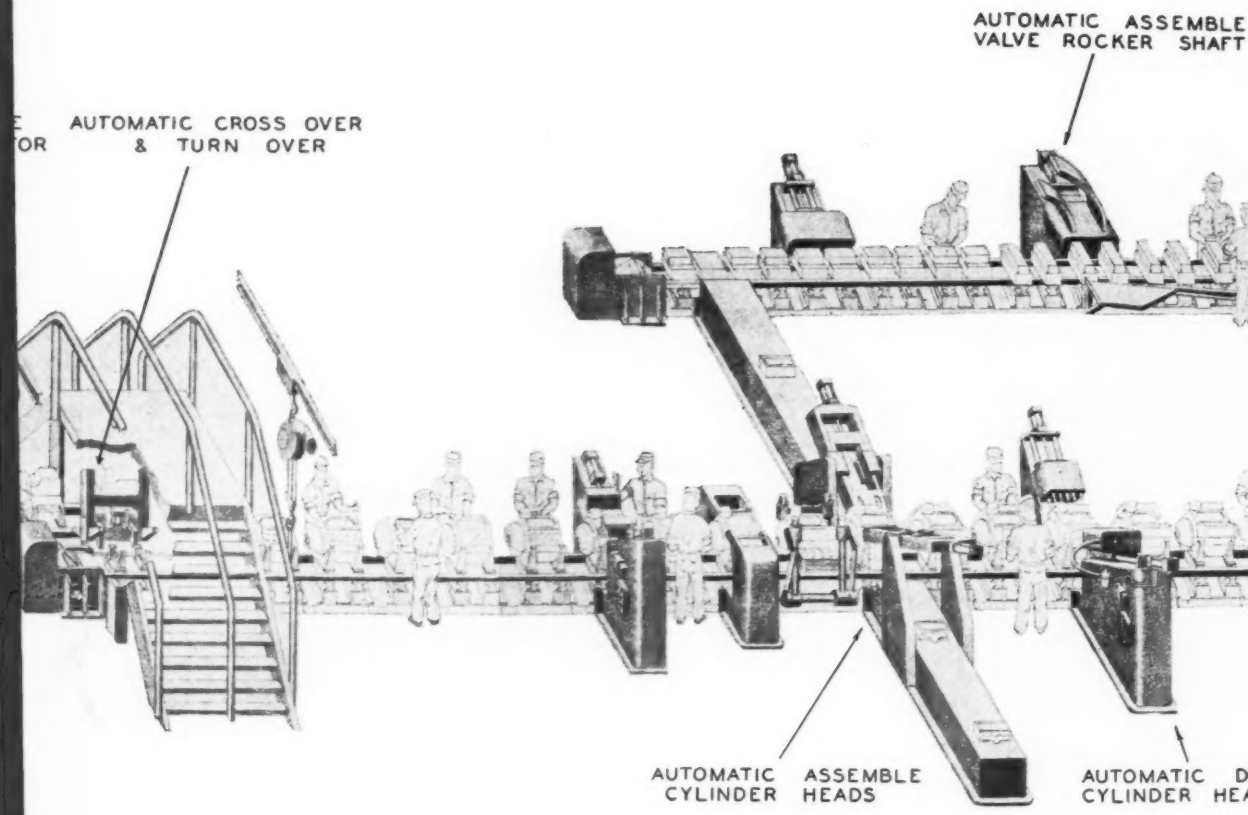

LOOSEN MAIN BEARING CAP BOLTS
AUTOMATIC SPRAY MAIN BEARINGS
AUTOMATIC ASSEMBLE CRANKSHAF
FLYWHEEL & CLUTCH ASSEMBLY
DRIVE MAIN BEARING CAP BO


AUTOMATIC DRIVE OIL PUMP SCREWS
AUTOMATIC DRIVE OIL PAN SCREWS
AUTOMATIC DRIVE OIL FILTER ADAPTOR
AUTOM
REPAIR STATION

Plymouth "Qualima

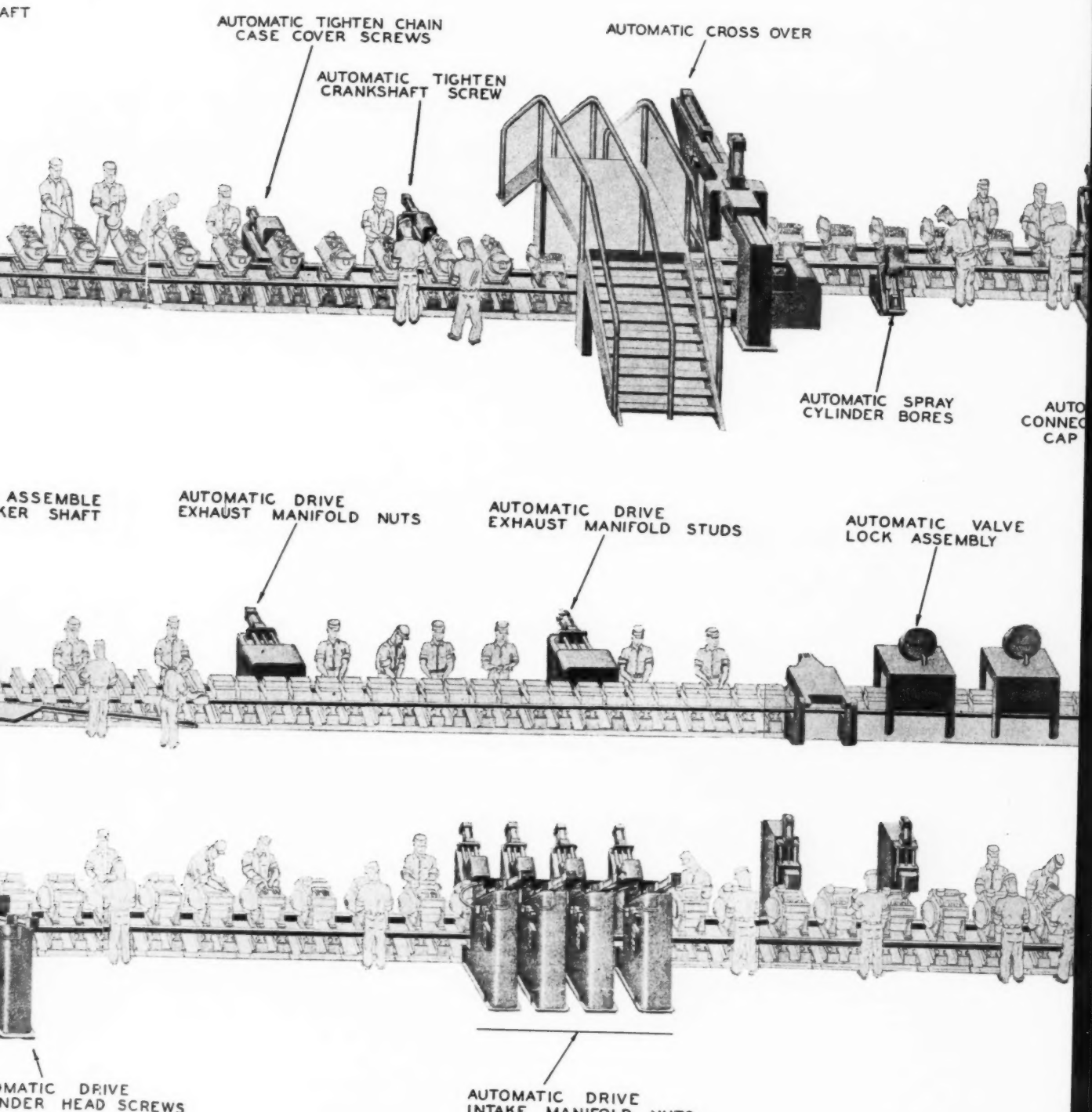
MECHANIZED ENG

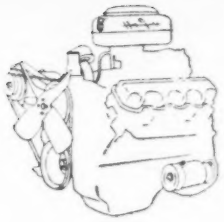

CRANKSHAFT ASSEMBLY
E MAIN RING CAP BOLTS
AUTOMATIC TIGHTEN CAMSHAFT THRUST PLATE SCREWS
AUTOMATIC TIGHTEN CAMSHAFT SPROCKET SCREWS
REPAIR STATION

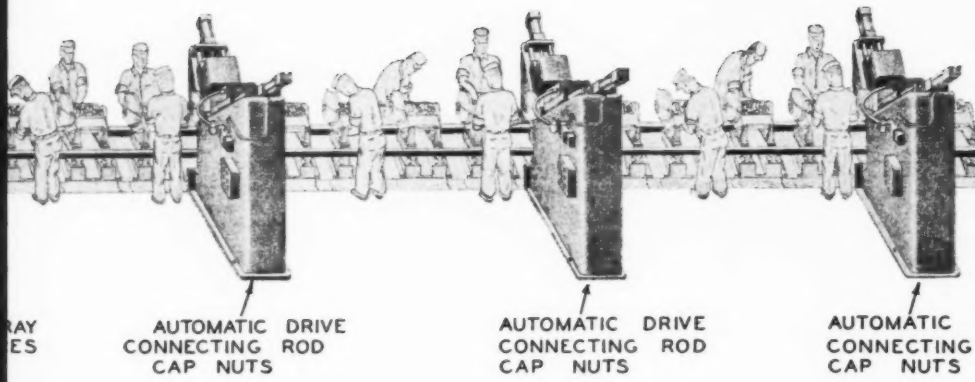

AUTOMATIC ASSEMBLE VALVE ROCKER SHAFT
AUTOMATIC CROSS OVER & TURN OVER
AUTOMATIC ASSEMBLE CYLINDER HEADS
AUTOMATIC D CYLINDER HEA

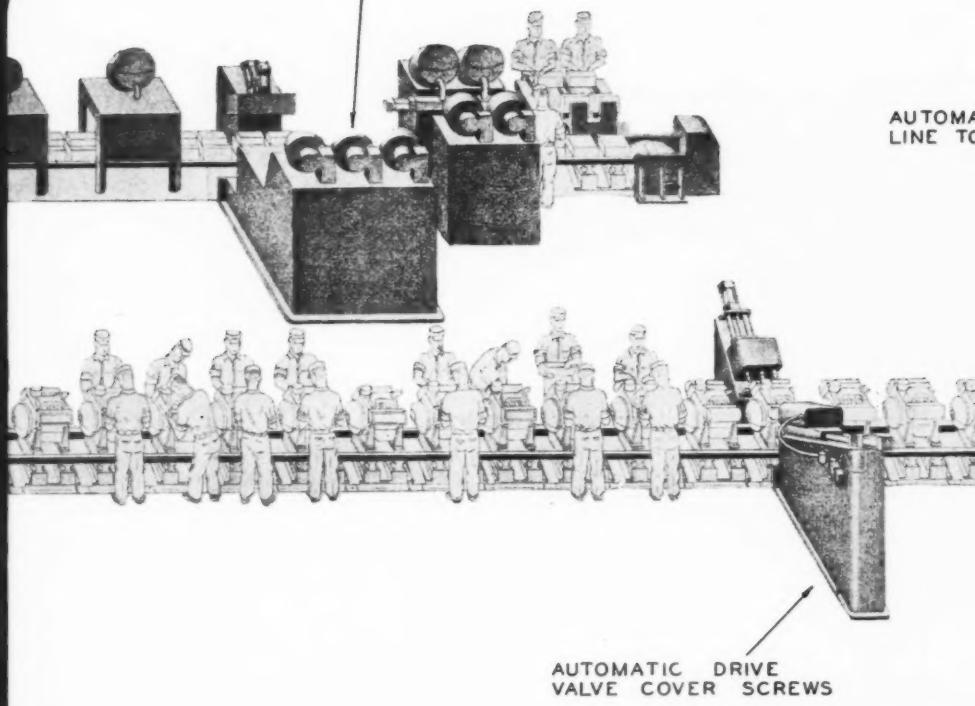
ualimatic" V-8 Engine Plant's

ENGINE ASSEMBLY LINE


AFT
AUTOMATIC TIGHTEN CHAIN CASE COVER SCREWS
AUTOMATIC TIGHTEN CRANKSHAFT SCREW
AUTOMATIC CROSS OVER
AUTOMATIC SPRAY CYLINDER BORES
AUTO CONNEC CAP
ASSEMBLE KER SHAFT
AUTOMATIC DRIVE EXHAUST MANIFOLD NUTS
AUTOMATIC DRIVE EXHAUST MANIFOLD STUDS
AUTOMATIC VALVE LOCK ASSEMBLY
MATIC DRIVE NDER HEAD SCREWS
AUTOMATIC DRIVE INTAKE MANIFOLD NUTS







Concept
Transfermatic Engi
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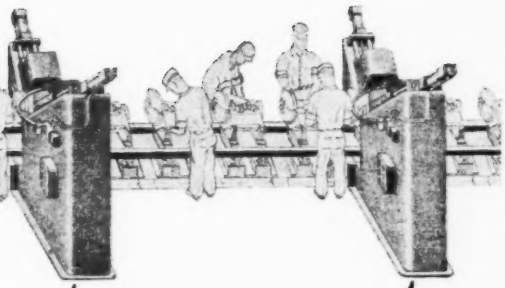
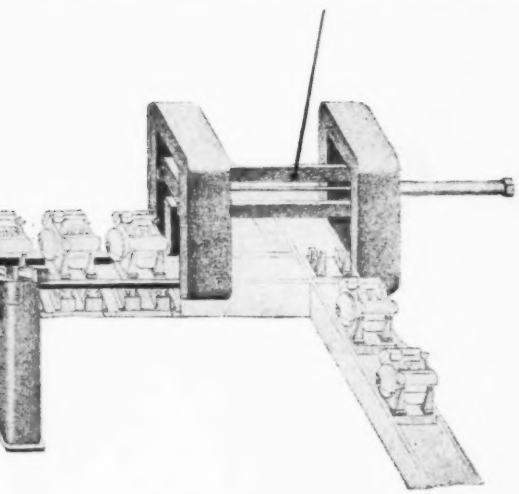


UTOMATIC DRIVE
ONNECTING ROD
AP NUTS

AUTOMATIC DRIVE
CONNECTING ROD
CAP NUTS

AUTOMATIC UNLOAD FROM FINAL
LINE TO PAINT & HOT TEST CONVEYOR



Concept Drawing of
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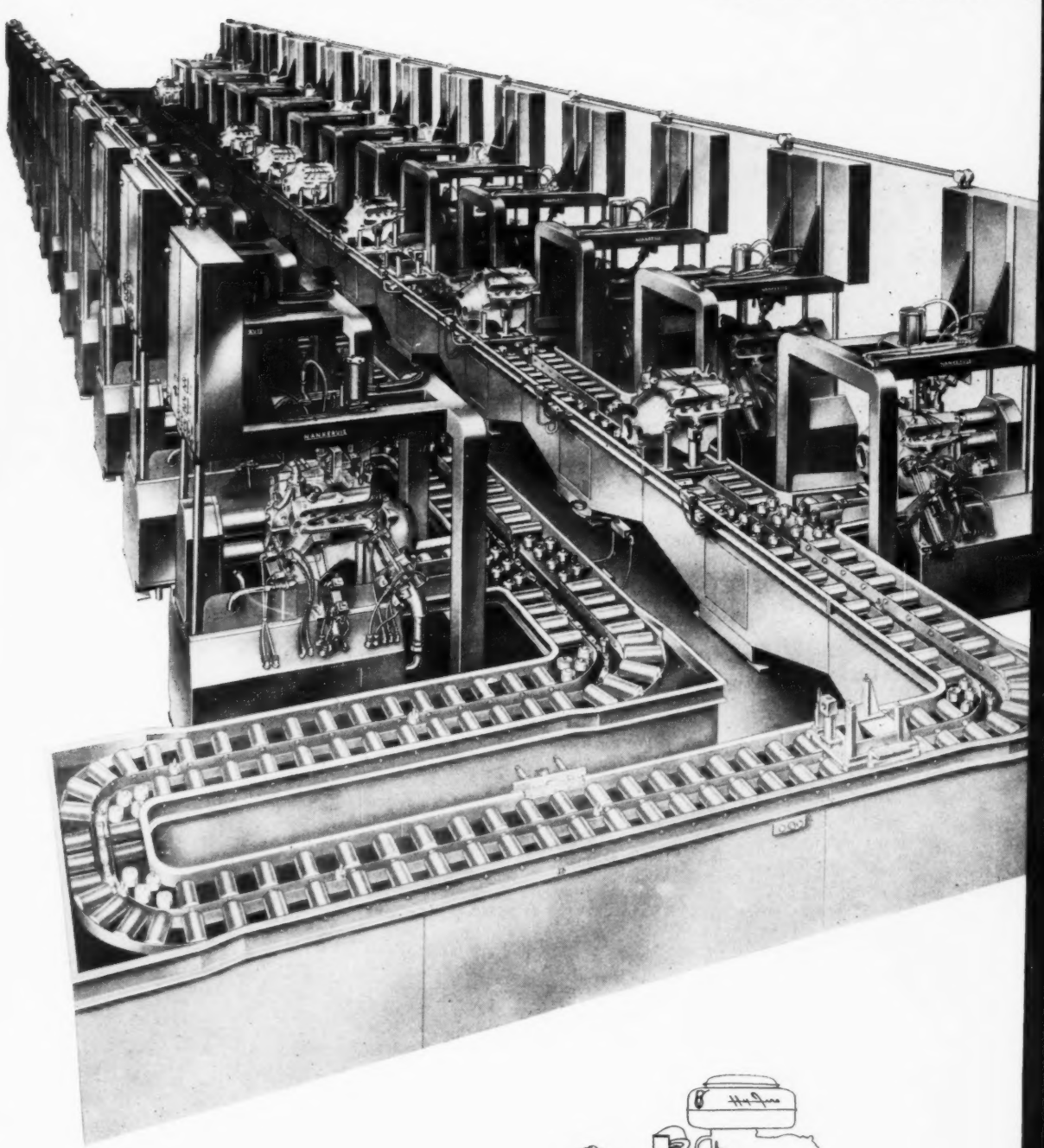
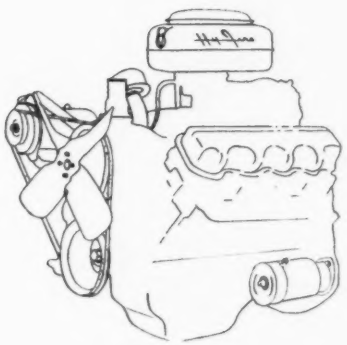
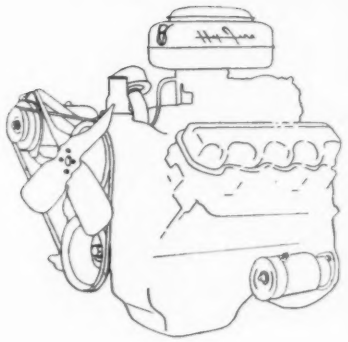
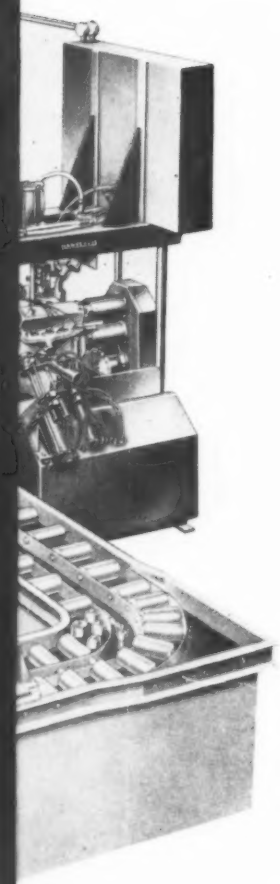
Designed & Built by
THE CROSS COMPANY









Plymouth's Qualimatic V-8 Gets Automatic "Hot Test"

THE AUTOMATIC HOT TESTING of the Plymouth Qualimatic V-8 engine presented some problems without precedent in the first running of an automobile engine fresh off the assembly line.

It is perfectly consistent, then, that the supplier of the automatic test stands, the George L. Nankervis Company, should come up with some equally unprecedented constructions with which to meet the Plymouth challenge.

Initially, there was Plymouth's expressed desire to put in some kind of a mechanical testing system, preferably of the transfer type, so that a certain number of engines could be taken off the line, be tested, and then passed on down the line.

This implied testing the engines in batches, whereby a number of engines would be taken from the line after assembly, transferred into the test stands for the 20-minute hot test, and then switched back on the conveyor line for the balance of the trip to either storage, freight platform, or dynamometer and repair area, The 20-minute dwell of a batch of engines in the test stands would result in a "stop and go" flow of engines after the hot test. The test stands would represent the first wholesale interruption of an engine-building process which up to that point had been one of a steady-paced, 150 engines per hour flow.

Many hours of skull practice and many gallons of midnight oil later, the engineers came up with plans for a continuous flow hot test having equal and steady-paced input and output rates; one engine in, and one engine out, at the manufacturing rate of 150 engines per hour or five engines every two minutes.

In consequence of the final design and construction, the hot test area receives the engines via overhead conveyor from the electrostatic

painting activity. Each engine is lowered from an overhead conveyor and positioned on a test pallet for its travel through any one of three batteries of test stands; 24 stands per battery. The test pallets are very accurate holding and positioning fixtures which must register the engine with a multitude of fittings within the the test stands. Each test pallet follows an in-and-out loop through one battery on a double roller track, being powered or hauled by a fixed-speed chain and pin-dolly running below the centerline of the track.

For subsequent economies and safeguards in storage and shipping the engines come to the hot test area without carburetor, air cleaner, oil filter, fuel pump, fan, starting motor, and generator. The individual test stands automatically substitute for the missing members.

As the engines flow through the hot test area they are strictly on a "free lance" basis. They are not in batches and they are not programmed. Each "green" (untested) engine is "looking" for an empty test stand. By the same token, each empty test stand is "looking" for a green engine. And, conversely, a green engine will not attempt to barge into an occupied test stand, nor will an empty test stand accept a once-tested engine.

It's not done with mirrors, but by ingenious indexing and control mechanisms functioning in conjunction with the engine pallets, the chain-driven pin dollies, and the test stand transfers.

The pin-dollies have four wheels each and run on a track of their own below the centerline of the double roller engine pallet trackway. The endless drive chain which makes the loop through each battery of test stands is secured to and supported by the pin-dollies which are spaced at 4′ intervals.

The pin-dolly cam follower arms projecting alternately to the right and left (or pointing toward and away from the test stands) plus stationary cams at the test stands and in the paths of the travelling cam follower rollers, are what set things in motion at the test stands, either to transfer an engine and pallet into the stand for hot test or to eject the engine and pallet at the completion of the test.

At the open end of each loop or battery of test stands, the engines, as they come via overhead conveyor from the electrostatic paint spray, are lowered by hoist on to test stand pallets hauled by "A" pin dollies only; i.e., every other pallet gets a green (untested) engine. The alternate "B" pin pallets (for tested engines) travel "light," or empty, through the loading area.

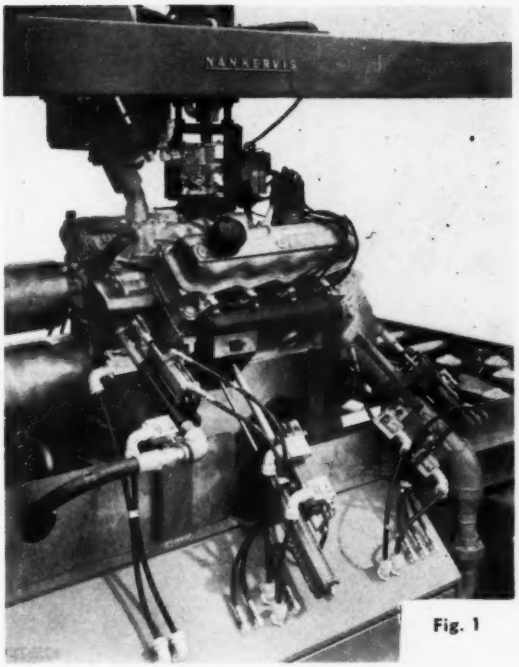


Fig. 1

An engine 'fixtured in" for test as seen (above) from the left side and (below) from the right side. The hot test area includes three conveyor U-shaped loops of 24 test stands each, totalling 72 test stands. The service fittings and clamping devices in the 72 test stands are advanced and retracted by over 900 air powered cylinders, all automatically triggered by the entrance and exit of the precision-built hot test stand pallet carrying the engine.

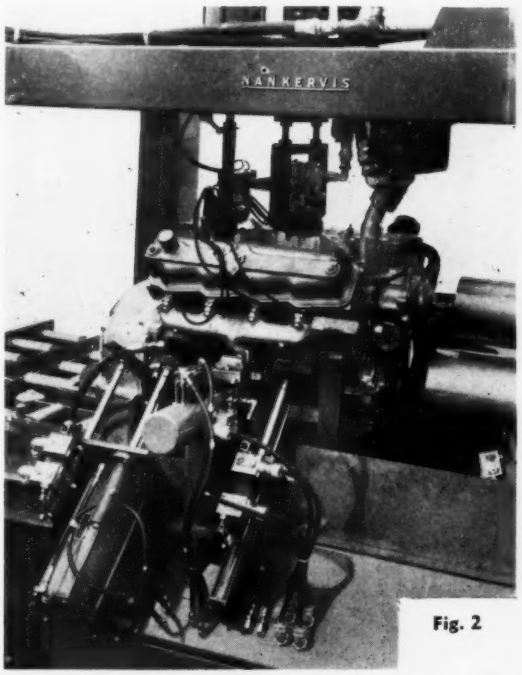


Fig. 2

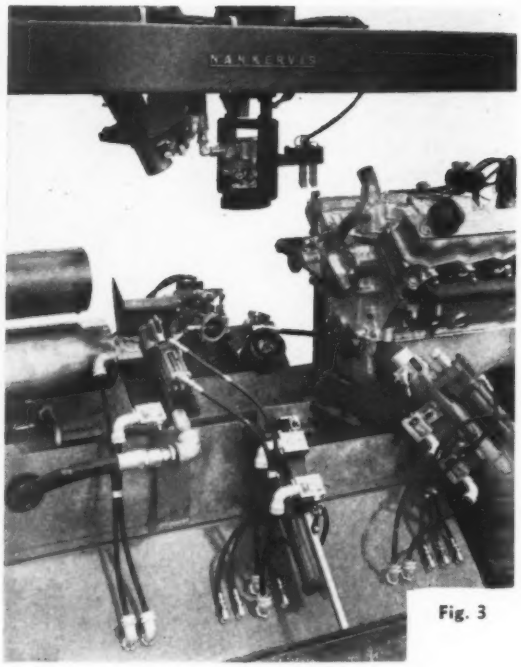


Fig. 3

An empty test stand with an engine on its way in. At the top are poised the fixtures carrying the coupling for the cooling water, the natural gas carburetor, and, projecting from the carburetor fixture, the two electrodes which will contact the two terminals plainly seen on the end of the ignition coil. At the lower right is the fixture which will couple onto the left side exhaust manifold. Middle foreground shows a positioning fixture, and next to the left is the fixture that engages the water pump inlet. The two large cylindrical housings at the extreme left are (upper) the water pump drive and (lower) the air powered cranking motor. At the rear, center, is the fitting which will engage the opening in the right side exhaust manifold.

Referring back to the stationary cams alongside (both sides) and below the dolly tracks at the test stand positions: there are two cams at each test stand; one which can be contacted only by the "in-pointing" cam roller arms of "A" pin dollies, and one which can be contacted only by the "out-pointing" cam roller arms of "B" pin dollies.

Relative to a given test stand, when an "A" pin dolly, hauling a test pallet and green engine, comes along, its cam roller arm contacts the corresponding stationary cam. If, and only if, the test stand is empty, the signal generated by the contact of a limit switch sets up the following sequence: when the pallet is squarely opposite the test stand transfer mechanism, the dolly's "A" pin is pulled down out of the slot in the bottom of the pallet; the dolly continuing on its way (back to the loading hoist) without skipping a beat. This leaves the pallet and engine parked on a ball bearing "direction changer", and permits the test stand transfer mechanism to pull the pallet into the stand; a movement at 90° to its previous travel along the conveyor rollway.

The precision-engineered pallet locates the engine in the test stand for the hot test series of automatic connecting and running hook-ups.

After the completion of the hot test, the next "B" pin dolly that comes along sends a signal (by virtue of its "out-pointing" arm and cam roller) to the test stand control board that an empty dolly is approaching. There-upon, if and only if, the test is completed, the transfer mechanism goes to work and shoves the tested engine and pallet out into the path of the oncoming "B" pin dolly. As the protruding "B" pin (trolley pole) approaches the pallet, the pin retracts, runs under the bottom of the pallet and is allowed to spring up and bear against the bottom of the pallet. When it comes to the slot in the pallet bottom it pops up into engagement and the pallet and engine are on their way to the unloading area. Of course, provision is made so that a "B" pin dolly will not try to take on a second engine.

This is how one test stand retrieves an untested engine from the moving line and gets it back into the procession after test. This in and out activity is multiplied by 72 for the entire test stand area of three 24-stand batteries.

Consequently, the engines pour into the test area, circulate through the maze in a fascinating state of orderly confusion, like a bingo game, duck into the first available test stand for the 20 minute test run, and then are ejected from the stand to again "fall in" with the 150 engine per hour parade. The whole setup is a fixed speed proposition; the only way to speed up the output of the test area would be to shorten the hot test run of the engines.

When a green engine is transferred into a test stand a lot of things happen all at once. The engines are so accurately located in the test stands by the test conveyor pallets that all of the fittings for the "utilities", i.e., water, fuel, gas, oil, and electricity, are brought automatically by air cylinder activated slides to the

respective openings in the engine. The same applies to hookups for the exhaust gas and drain oil.

The engines run in the hot test stands on natural gas for fuel, so a natural gas carburetor comes down and seats on the intake manifold fuel openings on top of the engine. This same fixture carries two electrical contacts that complete the circuit to feed the ignition coil primary.

As can be seen in the close-up photos of the engines in test stands, the other air cylinder powered slides come in from various angles to complete the water intake and outlet "plumbing", to power the water pump for circulation of the cooling water (in lieu of the fan pulley), to take off the exhaust gas, and, last but not least, a cranking air power motor actuates an adaptor which engages the front end hub and keyway of the crankshaft.

The entire test stand setup is designed to fail safe, i.e., should there be no fuel gas or electricity on tap, or should the oil and water supply pressure be off, the cranking effort will not be applied and a light on top of the stand will signal for an inspector.

The complete test cycle of 20 minutes starts with a slow rpm crank to insure engagement of the air starting motor with the crankshaft hub. It then goes into a 400 to 450-rpm spin for the 30 seconds necessary to start the engine running under its own power for the first time. During its first 16 or 17 minutes of operation oil is constantly flowing in and out of the engine for thorough flushing. At the end of this period a white light signals an inspector that the engine is ready for him to check. The external oil supply is cut off and the engine continues to operate on its own oil circulatory system.

He guns it, listens for tappet noises, and makes other visual inspections and notes his findings on a tag. Whether he accepts or rejects the engine, the test cycle cannot be completed until he pushes a button. This is not "automatic" but was provided at Plymouth's request, in order to insure that each engine gets the personal attention of an inspector.

After the inspector pushes the button the engine continues to run for two more minutes. After the two minutes are up, the engine stops, the water is drained out, an oil suction pump scavenges the oil from the pan, and the supply adaptors slide back — all automatically.

This leaves the engine free and disengaged, with the transfer mechanism in a state of readiness for a "tested engine" dolly on the test battery conveyor. When the next empty "B" pin dolly on the conveyor comes along, a limit switch signals the control board to set the transfer mechanism into action, as previously described, thus shoving the engine and pallet out on the conveyor and on the way to the unloading station for storage, shipping, or further adjustment and repair according to what the inspector ordered.

This shows that each test stand offers ready accessibility to the inspectors' final checking of each engine by sight and sound. On the control board are the signal lights which alert the inspector if anything is malfunctioning and summon him to witness the last two or three minutes of the test run.

At each test stand, all services—fuel, oil, water, air, and electric current — come from beneath the floor. This keeps the test stands free of extraneous plumbing and gives the inspectors easy access to the running engines. The mixed oil and water from completed tests is carried away below the floor for separation by centrifuging; the water flowing into the sewer system, the oil being destined for filtering and reuse.

In the Plymouth concept of Qualimatic V-8 manufacture, the hot test stands are in reality automatic, production line "go" or "no-go" gages. They do not establish limits or determine data—they are quality control devices which leave the interpretations and directives consequent to the engine tests in the hands of Plymouth quality control personnel—the inspectors.

NEW!

BAUSCH & LOMB WIDE FIELD MACROSCOPES

10X to 40X

Handy 'scopes spot-check production, speed small parts work

- Actual size as shown here ... compact, handy
- Shows natural right-side-up views... easier for inexperienced users... a big help in precision assembly!

Just grab this dependable inspection aid for on-the-spot checks of work and materials in any phase of production. Available with folding tripod or sturdy microscope stand, for detailed study and for small-parts assembly. You can even build it right into production machinery!

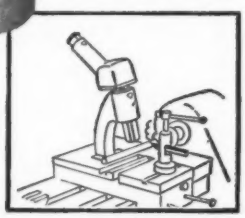
Upright images are sharp and detailed to the very edge of the extremely wide field of view. Long working distance makes it easy to manipulate specimens ... gives operators plenty of room for precision assembly and repairs. (Also available as straight tube for applications where upright image is not required.)

FREE DATA BULLETIN!
ON-THE-JOB DEMONSTRATION!

Find out how this inexpensive production tool can lower your manufacturing costs. WRITE, WIRE or PHONE today for free demonstrations and Data Bulletin D1052. Bausch & Lomb Optical Co., 79846 St. Paul St., Rochester 2, N. Y. (Phone: LOcust 3000).

Use it in tripod...

in microscope stand...



... or even built into machinery!

BAUSCH & LOMB
SINCE 1853

AMERICA'S ONLY COMPLETE OPTICAL SOURCE
... FROM GLASS TO FINISHED PRODUCT

CIRCLE INFORM-A-GRAM KEY NO. 1261

... Month's Talk, from page 60

lines, or waterlines. You can pick them up directly on your plastic duplication.

The type construction that is used in plastic duplicate models varies with the customer for whom you are making the duplicate. It varies with the size of the part and it varies with the fabricator who is building the model.

For small parts, it is very common to use a direct casting of a phenolic material. For a larger one, either polyester with a high glass content or epoxy also with a glass reinforcement is used. The supporting framework can be steel weldment or if you are interested in saving weight, you can use a plastic tubing framework. * * * *

In the case of checking fixtures or gages, plastics have found very wide acceptance in the automobile industry. It certainly isn't a cure-all, but they do offer advantages. Usually gages are made of metal, cast iron, steel, aluminum, all requiring kellering work or a lot of hand finishing. Plastics save time and money by eliminating the hand finishing work. Checking fixtures do not require the strength inherent in steel construction.

In cases where you are interested primarily in lightness, structural members can all be of plastic tubing. We have gages for windshield opening where the operators must pick them up and handle them. We formerly used aluminum. We have switched over to plastic construction now and it is much less fatiguing for the operator.

Another use of plastic that has come into the fore in the last few years has been its use for construction of development dies. Engineering sends out a new part; processing receives it. They examine the part and it looks like something we have been making for years. We know it will take seven operations to make it. Some bright boys says, "Let's do this and this, and eliminate two operations." We get to arguing about whether it can be done. There is one way to find out, that is, build a die and try it. If you build a cast iron die it takes a lot of money and time. In our development dies we use cast phenolic. It is about the easiest material for quick altera-

... Continued on page 128

THE MOTCH & MERRYWEATHER CUTTING TOOL MANUFACTURING DIVISION

offers you . . .

cutting tool aids to production

ASK YOUR DEALER ABOUT EVERY ONE OF THEM

SEGMENTAL TYPE • SOLID TYPE • SLITTING SAWS

• Get the full story on Motch & Merryweather's complete line of saw blades and slitting-slotting saws — a type, size, and thickness for *every* purpose. Triple-Chip cut-off blades up to 108" diameter down to slitting saws 3" in diameter — special saws — for any machinable material, ferrous or non-ferrous, any size, any shape, any thickness. Ask how the M & M Triple-Chip Method reduces tooth strains, prolongs blade life and speeds production with accuracy.

KROSLOK® FACE MILLING CUTTERS and SHELL END MILLS

Simplicity itself!

Only 3 members — body, blade, wedge. Blade and body are serrated in two directions to prevent shifting of the blade in the body. Cuts any machinable material. A profit-showing investment in *precision* production milling.

TRIPLE C® GRINDING COOLANT

Clear — Cool — Clean!

Triple C® grinding coolant makes for improved results and lower costs on all wet grinding. Transparent, stable solutions; maximum cooling; grinding wheels stay clean and free-cutting.

TRIPLE-CHIP HEAVY DUTY ANTI-WELD SOLUBLE OIL

M & M Heavy Duty Anti-Weld Soluble Oil lengthens tool life, especially under severe conditions. Deters "pick-up", cuts rejects, is oily (not greasy), odorless; lowers production costs.

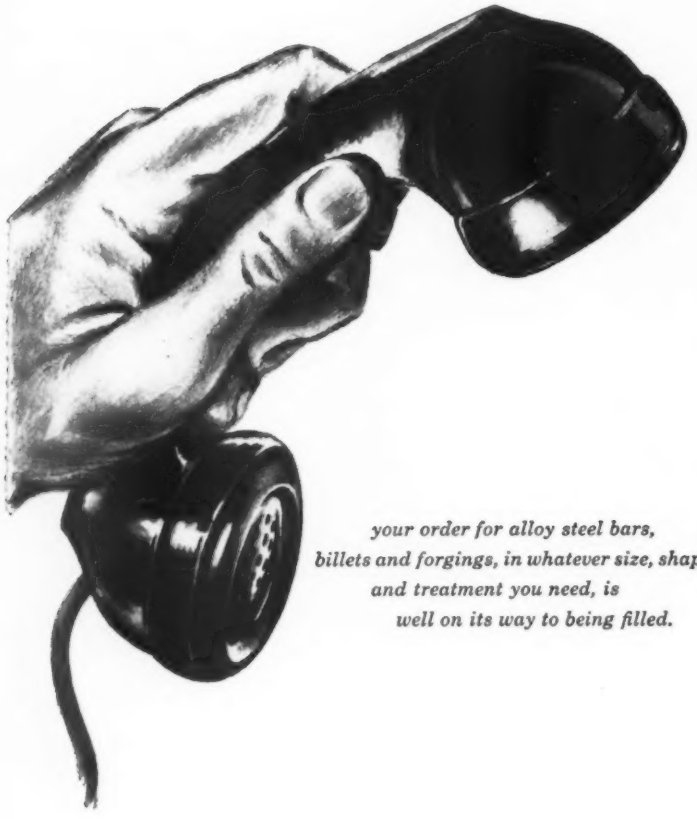
THE MOTCH & MERRYWEATHER MACHINERY CO.

Cutting Tool Manufacturing Division

1250 EAST 222nd STREET, CLEVELAND 17, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1271

Before you hang up,



your order for alloy steel bars, billets and forgings, in whatever size, shape and treatment you need, is well on its way to being filled.

All seven of our modern warehouses are located in principal industrial areas . . . near you. Each one is well-stocked: equipped to fill your alloy steel requirements promptly, whether you need standard AISI, SAE or our own special HY-TEN steels—"the standard steels of tomorrow". Every warehouse, too, is staffed with experts in metallurgy who are ready to serve you.

Write today for your FREE copies of Wheelock, Lovejoy Data Sheets. They contain complete technical information on grades, applications, physical properties, tests, heat treating, etc.

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Warehouse Service — Cambridge • Cleveland • Chicago
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WHEELOCK, LOVEJOY & COMPANY, INC.

135 Sidney Street, Cambridge 39, Massachusetts

CIRCLE INFORM-A-GRAM KEY NO. 1281

. . . Month's Talk, from page 126

tions; you can use it with working tools. We build up what we think is the right draw line, cast the punch, put it together with the die and cast the blankholder ring, and in a very short time we know whether or not we can make parts. If you find it does work, you save the cost of the eliminated operations.

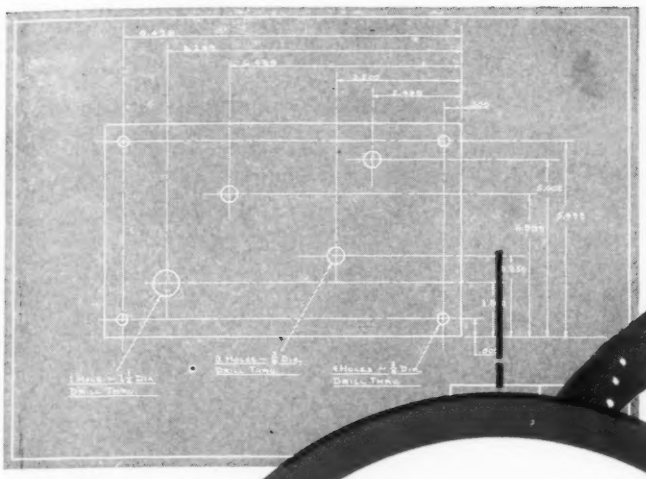
We are building three different development dies on a part that now is in production, so there will be four different ways to make the part. The purpose is to find a better stamping. * * * *

Another broad field is the use of plastics in assembly fixtures. This is coming more and more into the fore. One of the large automobile companies made up a set of assembly fixtures for hoods. They use a cast iron base, put their casting over a mold, pour in the plastic so that they had a plastic surface on the cast iron approximately a quarter inch thick. The wear is not great on the plastic and it saves the hand finishing time on cast iron.

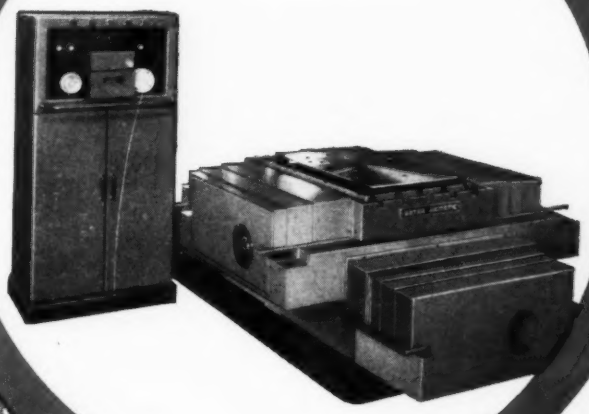
Aside from assembly fixtures, we have drilling fixtures. The usual procedure, if you have to make a drilling fixture, is to build it up of steel. You can weld-up the steel straps and put bushings in, or perhaps use them without bushings. You do the same thing with plastic; use plastic straps. You pick up your hole location right from the model so you have no layout to do. Drill through the plastic, insert bushings and you are ready to go to work. Some people mold their bushings in place. In any case, you are able to build a convenient light fixture in a short period of time.

That just about covers the supplementary tooling in the stamping plant where plastics may be of service to you. People are always coming up with new uses, and improvements are to come. Plastics are certainly limited as far as forming goes. When it comes to building stripping pads and locators, you can mold your contour exactly. You can mold against a model or against a part, but plastics certainly, as Mr. Voss said, are here to stay. * * * *

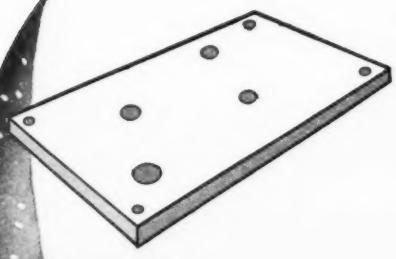
BUY U. S. SAVINGS BONDS



this tape will save you $ thousands per year



the **ARTER JIGMATIC**



AUTOMATIC, TAPE CONTROLLED POSITIONING FOR VERTICAL DRILLING

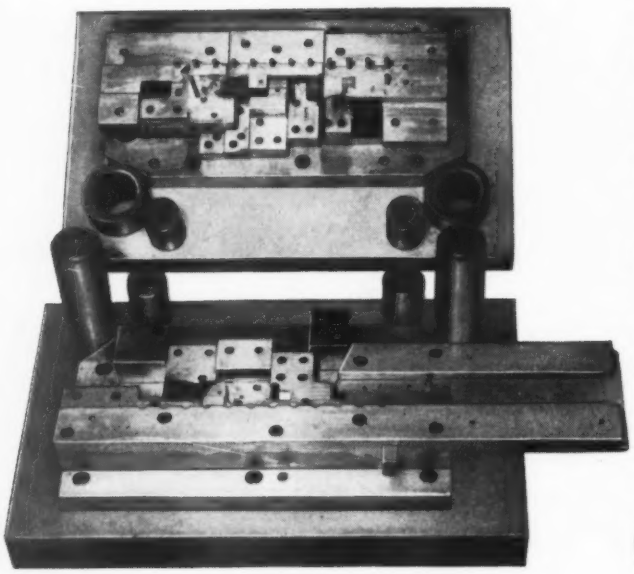
From blueprint to finished piece — it's all in the tape! Your engineering department punches the tape for desired hole locations. All your operator need do is push the "Position" button, then drill the holes. Costly set-up time is practically eliminated. There are no jigs or fixtures; no stops to set. Savings in set-up time alone amount to thousands of dollars per year.

Write for Bulletin T 55b

ARTER grinding machine company WORCESTER, MASS.

CIRCLE INFORM-A-GRAM KEY NO. 1291

STREAMLINES PRODUCTION of STOP-LATCHES for RANGE TIMER



BARTH 9 STATION PROGRESSIVE DIE

Progress at

1—Pierce pilot holes
2—Pierce 2 elongated holes
3—Blank half of part
4—Preform

Each Station

5—90° double bend
6—Pierce hole
7—Bend 1 ear up
8—Bend 1 ear down
9—Finish blanking part

The BARTH Corporation

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MANUFACTURING • DESIGNING • ENGINEERING

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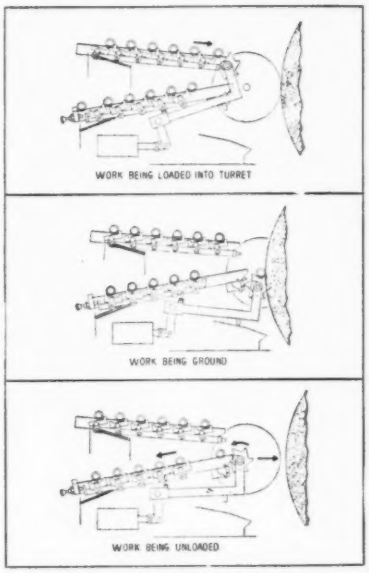
CIRCLE INFORM-A-GRAM KEY NO. 1301

Automatic Loading Device for Small Part Grinding

A device for automatically loading workpieces between two grinder centers and removing the pieces when ground has been developed by Norton Company. With variations to suit conditions it can be adapted to a wide variety of small parts that can be rolled by gravity on inclined rails, and permits an operator to attend a battery of machines.

The device is of the turret type, supporting the work near both ends. A number of workpieces may be placed on the loading rails by the operator or fed to the loader from a suitably placed conveyor. Latches placed along the loading rails separate the parts and operate to release a single piece at a time to the turret.



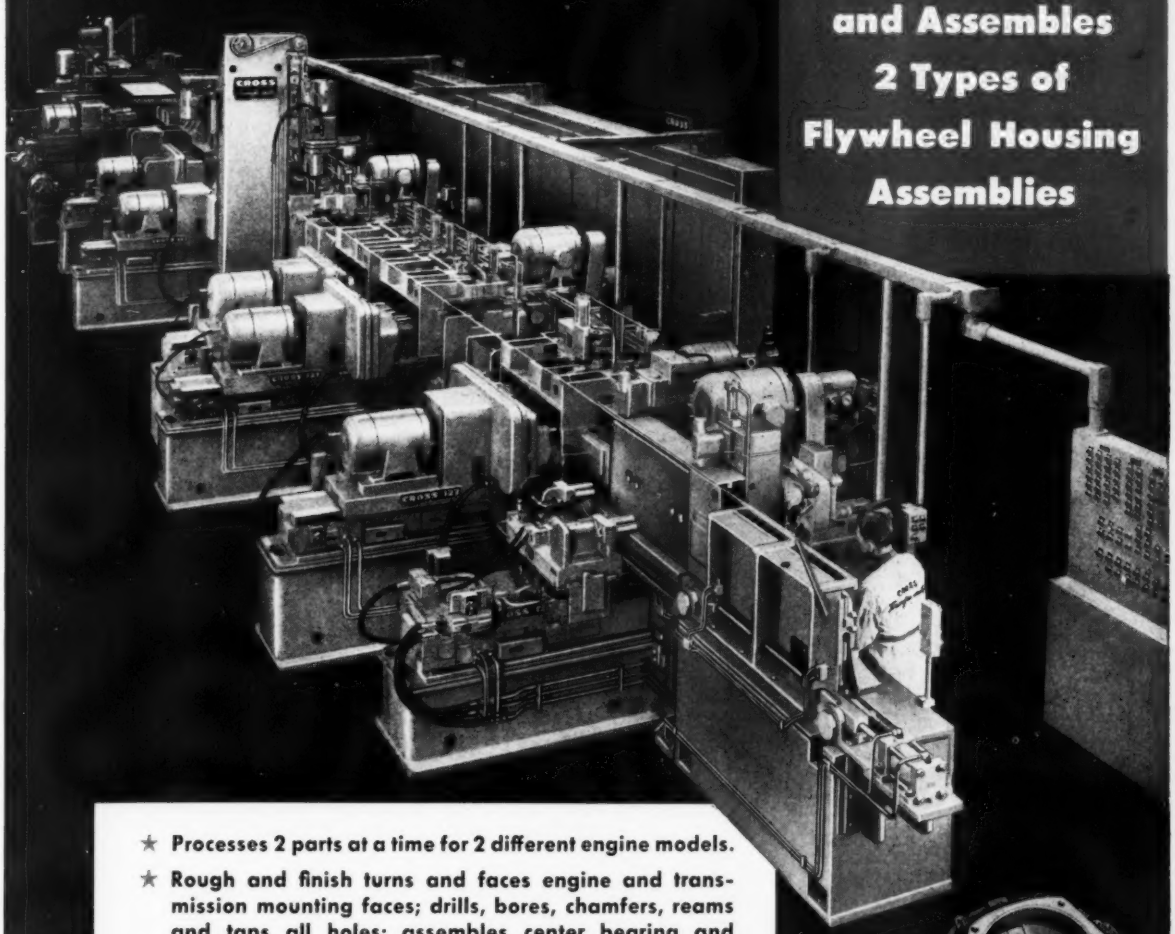
Diagramatic sketch showing the three turret positions for loading, grinding and unloading.

The turret is carried on a swinging arm, the motion of which is controlled by a small hydraulic cylinder and piston operated by a valve in the operating cycle of the machine. When a workpiece is received in the turret, the arm swings the turret to locate the piece in line with the work centers which as they enter the center holes raise the piece to clear the turret fingers and permit free rotation.

After the piece has been ground, the turret arm swings upwards and a latch indexes the turret so that the piece rolls onto the inclined unloading rails. The turret arm continues its upward motion to the loading position where the turret receives the next piece. Latches along the unloading rails automatically accept and release one piece at a time keeping the pieces separated, thus eliminating any chance of the finished surfaces being marred.

Another Transfer-matic by Cross

Bores, Faces, Drills and Assembles 2 Types of Flywheel Housing Assemblies



★ Processes 2 parts at a time for 2 different engine models.

★ Rough and finish turns and faces engine and transmission mounting faces; drills, bores, chamfers, reams and taps all holes; assembles center bearing and 2 dowels; finish bores and inspects center bearing after assembly; washes, dries parts for final assembly.

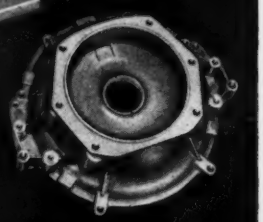
★ 314 pieces per hour at 100% efficiency.

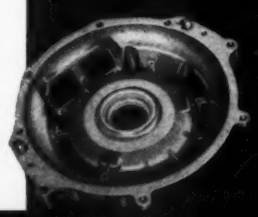
★ 20 stations: 1 loading; 10 machining; 2 assembling; 4 inspecting; 2 cleaning; 1 unloading.

★ Pre-set tools to reduce downtime for tool changing.

★ Complete interchangeability of all standard and special parts for easy maintenance.

★ Other features: Construction to J.I.C. standards; hydraulic feed and rapid traverse; hardened and ground ways; automatic lubrication.





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THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

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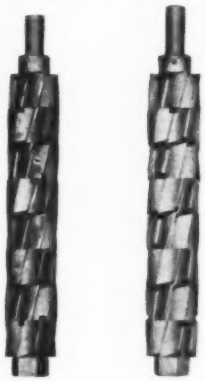
WITH LIQUAMATTE® WET BLASTING

FINISHING DIES

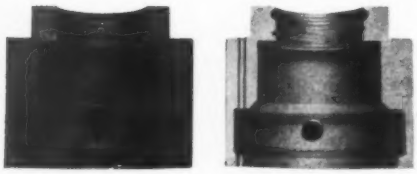
BEFORE AFTER

EXTENDING TOOL LIFE



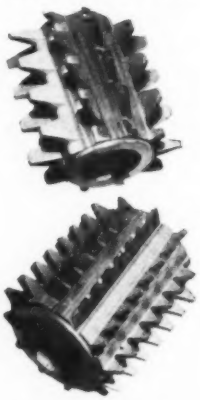
BEFORE AFTER

FINISHING MOLDS

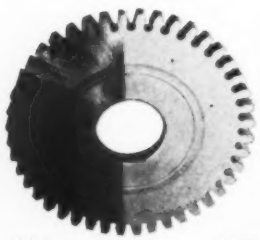


BEFORE AFTER

REMOVING FEATHER EDGES FROM TOOLS



REMOVING DIRECTIONAL LINES



BEFORE AFTER

40 PRECISION FINISHING OPERATIONS WHERE COSTS CAN BE CUT

The money-saving versatility of Liquamatte wet blasting in precision finishing and cleaning applications is illustrated in this new 20-page Bulletin, No. 451-D. Write for your free copy today.

WHEELABRATOR
CORPORATION
(Formerly American Wheelabrator & Equipment Corp.)
852 S. Byrkit Street Mishawaka, Indiana

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"Commendable Comments"

"The task ahead lies in our ability to develop and apply mechanisms to control automatically, feed, adjust, measure, and repeat cycles without manual effort . . . Before these requirements can be met, there must be a readjustment of philosophy throughout industry. The machine tool industry, manufacturers, and the electrical control industry must work as a team . . . Automatic manufacturing is being developed around standard basic machine tools. Hence it is of vital interest to the customer to find emphasis being put on the flexibility features of standard machines with a potential that such flexible components may be easily positioned on a production line tied together in such a way that automation follows as a natural sequence."

—From an address by Mr. W. C. Allen, Director of Manufacturing and Equipment Engineering of the Westinghouse Electric Corporation at the 1955 Machine Design Division Conference of the American Society of Mechanical Engineers.

"America has two powerful economic weapons with which it can meet the problems of its expanding economy and realize tremendous growth and accomplishment in the years ahead . . . These weapons are the application of science and technology to industry on a broader and more intensive scale and they are the wise use of the power of taxation . . ."

—From an address by Gwilym A. Price, President of the Westinghouse Electric Corporation at a meeting of the Denver, Colorado Chamber of Commerce.

"Efficient production — even when this efficiency can be attained only by investment in costly machines."

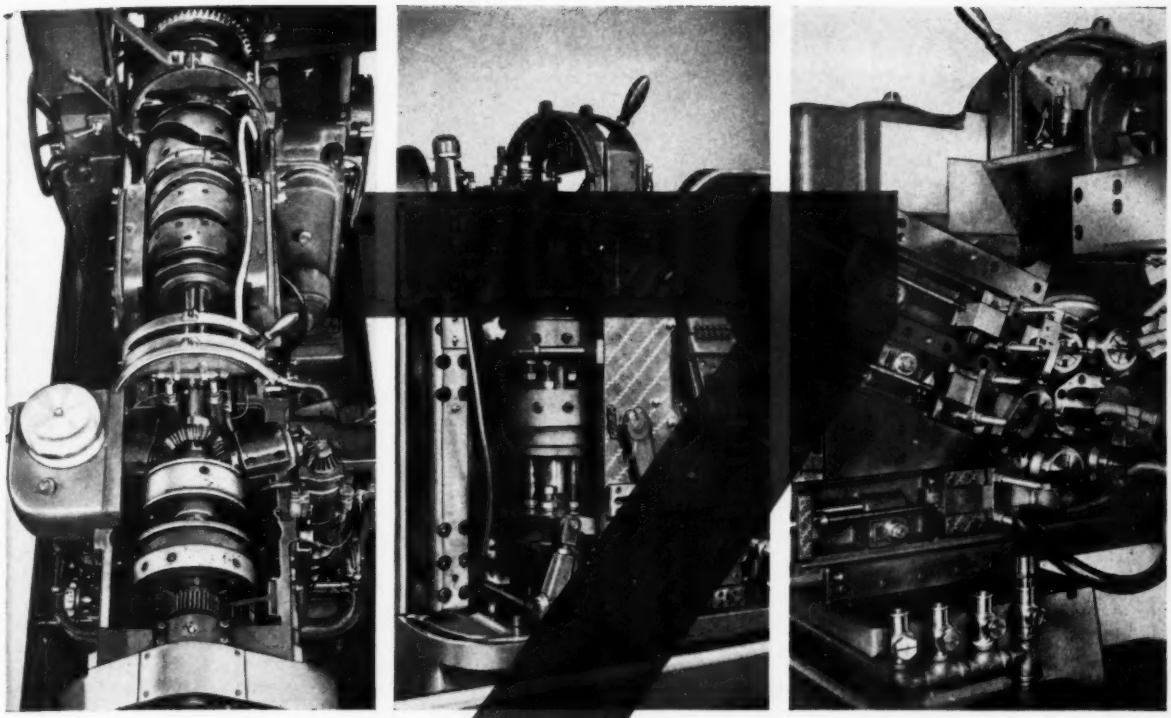
—From an address by Roy C. Ingersoll, President and Chairman of the Board of Borg-Warner Corporation at the 23rd Annual Convention Institute of Appliance Manufacturers, Cincinnati, Ohio.

"As our technology improves, our strength tends to become more dependent on quality. A thousand interceptors that could not fly as high as an enemy bomber would not be as good as one that could fly higher . . ."

—General Nathan F. Twining, Chief of Staff, United States Air Force.

"Old-time craftsmen were able to produce almost any product with a very few fundamental tools, but these tools are almost useless in the hands of the novice. Consequently, it is necessary that the tools supply the need, skill and knowledge which the novice lacks."

—From an address by Mr. E. P. Bullard, III, Pratt & Whitney Aircraft Corp., at the 1955 ASME Machine Design Division Conference held at New York Univ.

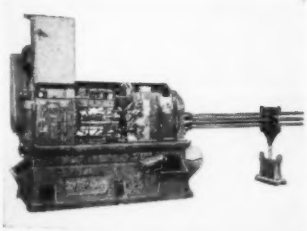


Seven Fast Changeover Models

With the prospects of improved tool materials ever decreasing the actual machining time of work on Multiple Spindle Automatics, long runs tend to become short runs. Facility that decreases the time for job changes becomes more important to low-cost production.

Conomatics are available in as many as seven fast changeover models. These are the 9/16", 1", 1⅝" Sixes, and the 2⅝", 3½", 5", and 5¼" Fours.

These models are equipped with dial adjustment of working stroke of all slides, without making necessary change of total stroke or positive stop settings. Write, wire, or phone for literature descriptive of these features and other facilities available to users, or prospective users.



Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U. S. A.

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SPECIAL MARKING MACHINES

by Parker

Vaccinate HYPODERMIC NEEDLES

. . . by the thousands . . . with precision
. . . and economy!

Pharmaceutical people lay down the most exacting requirements. That's why Parker was given the challenge to design and build this super-special marking machine. Dial operated, it marked 60 needle holders per minute—no trial and error—every impression perfect! That's our story. What's your problem? Parker can do the same for you.

To protect your **MARKET . . . Mark it!**

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THE PARKER STAMP WORKS, INC.
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Will You Be There?

Oct. 5-9. World Plastics Fair and Trade Exposition. National Guard Armory, Exposition Park, Los Angeles.

•

Oct. 10-12. American Society of Lubrication Engineers and American Society of Mechanical Engineers, Lubrication Activity Committee. 2nd Joint Lubrication Conference. Antlers Hotel, Indianapolis, Ind.

•

Oct. 17-21. American Society of Metals, American Welding Society, and others. National Metal Congress and Exposition. Philadelphia Convention Halls, Philadelphia, Pa.

•

Oct. 17-21. National Safety Council. 43rd National Safety Congress and Exposition. Conrad Hilton, Congress, and La Salle Hotels, Chicago, Ill.

•

Oct. 24-26. American Standards Association and National Bureau of Standards. 37th Annual Meeting of American Standards Association. Sheraton Park Hotel, Washington, D. C.

•

Oct. 26-28. American Society of Body Engineers. 10th Annual Technical Convention. Rackham Memorial Building, Detroit, Mich.

•

Oct. 27-28. Illinois Institute of Technology and Armour Research Foundation of IIT. 11th Annual National Conference on Industrial Hydraulics. La Salle Hotel, Chicago, Ill.

•

Nov. 2-4. National Fluid Power Association. Edgewater Beach Hotel, Chicago, Ill.

•

Nov. 3-6. National Tool & Die Manufacturers Association, Convention and Board Meeting. Statler Hotel, Detroit, Mich.

•

Nov. 9-11. 19th Annual Time and Motion Study and Management Clinic. Industrial Management Society. Hotel Sherman, Chicago, Ill.

•

Nov. 14-17. Second International Automation Exposition. Chicago Navy Pier, Chicago, Ill.

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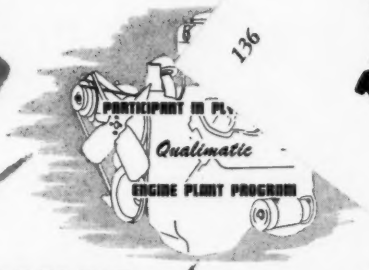
Nov. 28-Dec. 1. Air Conditioning & Refrigeration Exposition. Atlantic City Auditorium, Atlantic City, N. J.

Check



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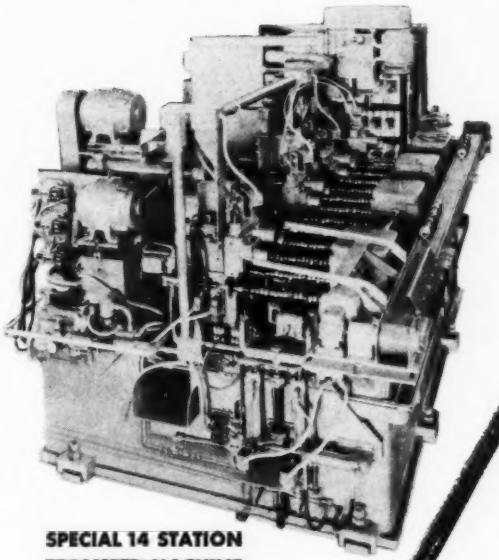
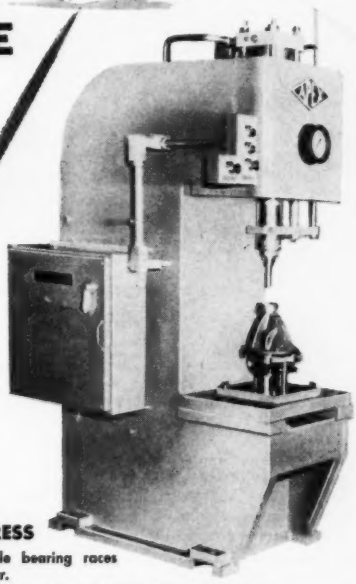
for QUALITY and PERFORMANCE



SPECIAL 14 STATION TRANSFER MACHINE

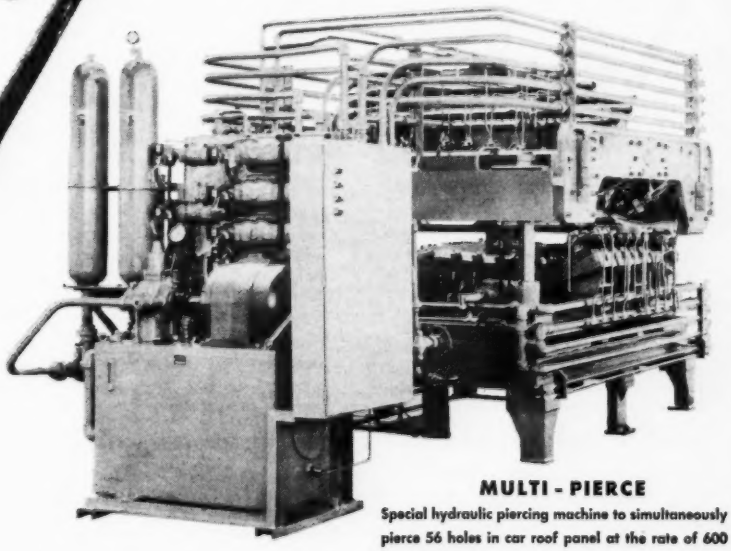
To mill keyway - mill to length - drill - counterbore - ream - tap and probe all holes in camshaft.



STANDARD HYDRAULIC PRESS

Arranged to assemble bearing races into differential carrier.

Press capacities range from 2 ton to 50 ton. Special frames to suit unusual conditions.



MULTI - PIERCE

Special hydraulic piercing machine to simultaneously pierce 56 holes in car roof panel at the rate of 600 PER HOUR.

APEX **TOOL & DIE COMPANY** ROSEVILLE MICHIGAN

DESIGNERS AND BUILDERS OF SPECIAL MACHINES

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. . . by the thousands . . . with precision
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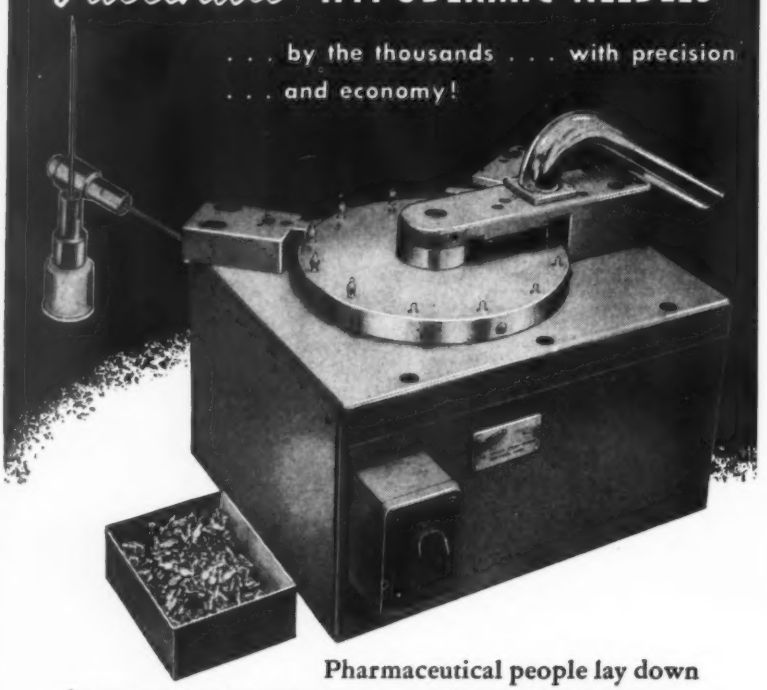

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Oct. 17-21. National Safety Council. 43rd National Safety Congress and Exposition. Conrad Hilton, Congress, and La Salle Hotels, Chicago, Ill.

•

Oct. 24-26. American Standards Association and National Bureau of Standards. 37th Annual Meeting of American Standards Association. Sheraton Park Hotel, Washington, D. C.

•

Oct. 26-28. American Society of Body Engineers. 10th Annual Technical Convention. Rackham Memorial Building, Detroit, Mich.

•

Oct. 27-28. Illinois Institute of Technology and Armour Research Foundation of IIT. 11th Annual National Conference on Industrial Hydraulics. La Salle Hotel, Chicago, Ill.

•

Nov. 2-4. National Fluid Power Association. Edgewater Beach Hotel, Chicago, Ill.

•

Nov. 3-6. National Tool & Die Manufacturers Association, Convention and Board Meeting. Statler Hotel, Detroit, Mich.

•

Nov. 9-11. 19th Annual Time and Motion Study and Management Clinic. Industrial Management Society. Hotel Sherman, Chicago, Ill.

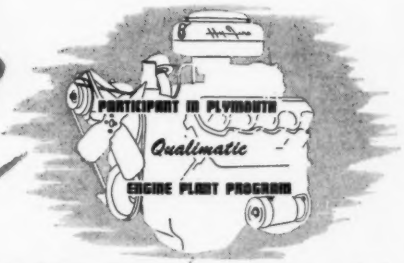
•

Nov. 14-17. Second International Automation Exposition. Chicago Navy Pier, Chicago, Ill.

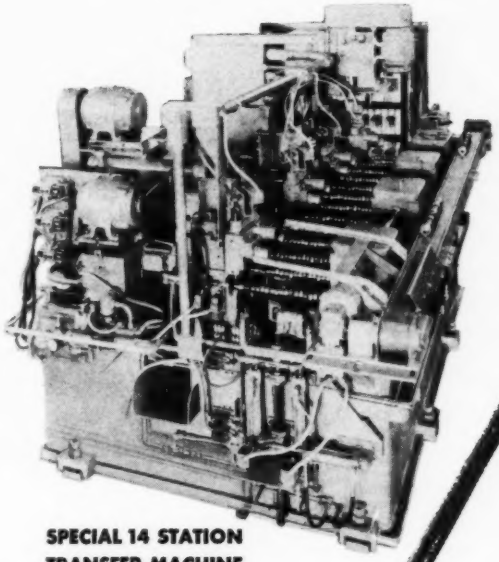
•

Nov. 28-Dec. 1. Air Conditioning & Refrigeration Exposition. Atlantic City Auditorium, Atlantic City, N. J.

Check

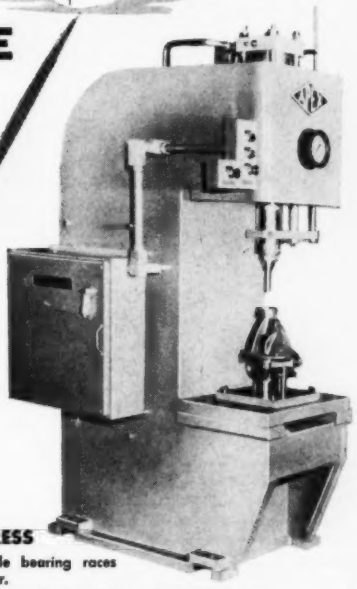


for QUALITY and PERFORMANCE



SPECIAL 14 STATION TRANSFER MACHINE

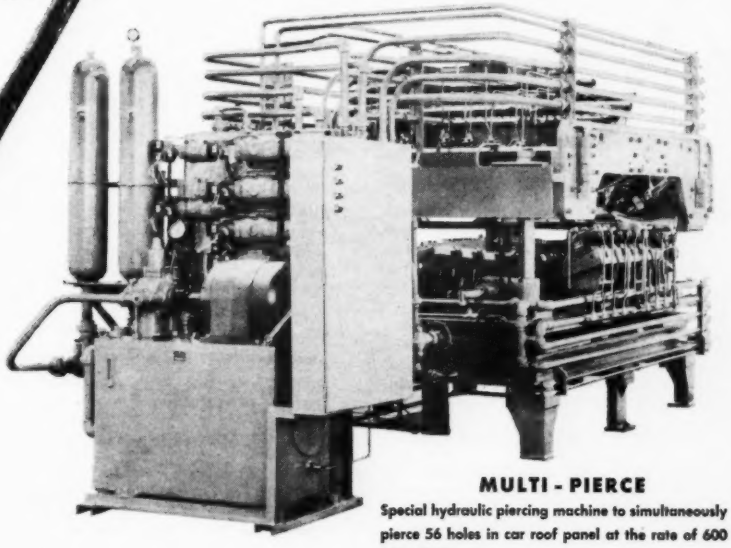
To mill keyway - mill to length - drill - counterbore - ream - tap and probe all holes in camshaft.



STANDARD HYDRAULIC PRESS

Arranged to assemble bearing races into differential carrier.

Press capacities range from 2 ton to 50 ton. Special frames to suit unusual conditions.



MULTI - PIERCE

Special hydraulic piercing machine to simultaneously pierce 56 holes in car roof panel at the rate of 600 PER HOUR.

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DESIGNERS AND BUILDERS OF SPECIAL MACHINES

CIRCLE INFORM-A-GRAM KEY NO. 1351

They All Look Alike but . . . How is Their "*SQ?"

Why Fido is nostalgic over a certain hydrant is shrouded in canine concealment. Perhaps dogs have an "S.Q." (scent-quotient) that tells the tale . . . or should that be "tail?"

Anyhow, here at COMPOSITE FORGINGS we have definite ideas about another kind of "S.Q." . . . an intangible business asset we call our "service-quotient." Our "S.Q." may be as important to you as a hydrant is to a dog.

COMPOSITE FORGINGS was founded and has grown on devotion to a policy of SERVICE . . . "hand-tailored" to fit the needs of each particular customer with craftsmanship, engineering "know-how," experience, and modern facilities unique in our phase of industry.

That's why we maintain a high "S.Q." . . . why, time and time again, leading manufacturers—like those below—turn with confidence to COMPOSITE FORGINGS for *special* services requiring *special* skills, *special* knowledge and *special* equipment.

Snyder Tool & Engineering Co. · Modern Industrial Engineering Co. · Micromatic Hone Corp. · Krueger-Barnes Corp. · Colonial Broach Co. · Apex Tool & Die Co. · American Broach & Machine Co. · Ex-Cell-O Corp. · Buhr Machine Tool Co. · Wilson Automation Co. · The Cross Co. · Michigan Drill Head Co.

C F INC.

*service-quotient

FOR STRENGTH . . . *Forgings*

Toughness . . . resistance to breaking . . . greater durability . . . high strength at elevated temperatures—all are good reasons why *forgings* are preferred for manufacturing highly stressed mechanical parts.

COMPOSITE FORGINGS' "tailor-made" flat die forgings, rough turned or machined, offer exceptionally high physical properties, tensile strength and yield. Brinnel tested for proper machinability.

FOR VERSATILITY . . . *Weldments*

Easily and economically modified to meet changing technological demands, *weldments* offer many advantages to the manufacturer of machine tools and heavy special machinery.

Employing latest techniques and equipment, COMPOSITE FORGINGS' weldments are thoroughly normalized, grit-blasted, and even painted—if so desired—to customer's specifications.

FOR UNUSUAL SAVINGS . . . *Composite Die Sections*

Electrically welded *composite die sections*, uniting a hard steel cutting edge to a soft base, offer many cost saving advantages to users of blanking, forming, trimming or cutting dies. Elimination of heeling, much machining and labor—together with savings in steel—are just a few of the contributing factors that make composite die sections economical and practical in the construction of intricate dies. COMPOSITE FORGINGS has a corps of experts ready to discuss die problems with you. They will be happy to serve you.

COMPOSITE FORGINGS, INC.

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CIRCLE INFORM-A-GRAM KEY NO. 1361

Other Operations Worthy of Mention

IT HAS BEEN IMPRACTICAL to cover any of the Plymouth V-8 production lines in great detail, and impossible to describe all of the important operations and practices. Neither space nor time permits mention of all. A random assortment of operations not described elsewhere are presented here.

Left-hand exhaust manifolds are processed on two Michigan Drill Head Co. horizontal and vertical way type machines equipped with automatic dial index tables and power clamping fixtures. Both machines incorporate standard Michigan components such as hydraulic feed units with automatically lubricated, hardened and ground steel ways. The fixturing is especially noteworthy since the part is a rough casting and must be held securely while not distorting it, when milling at 290 sfpm and 11 ipm feed.

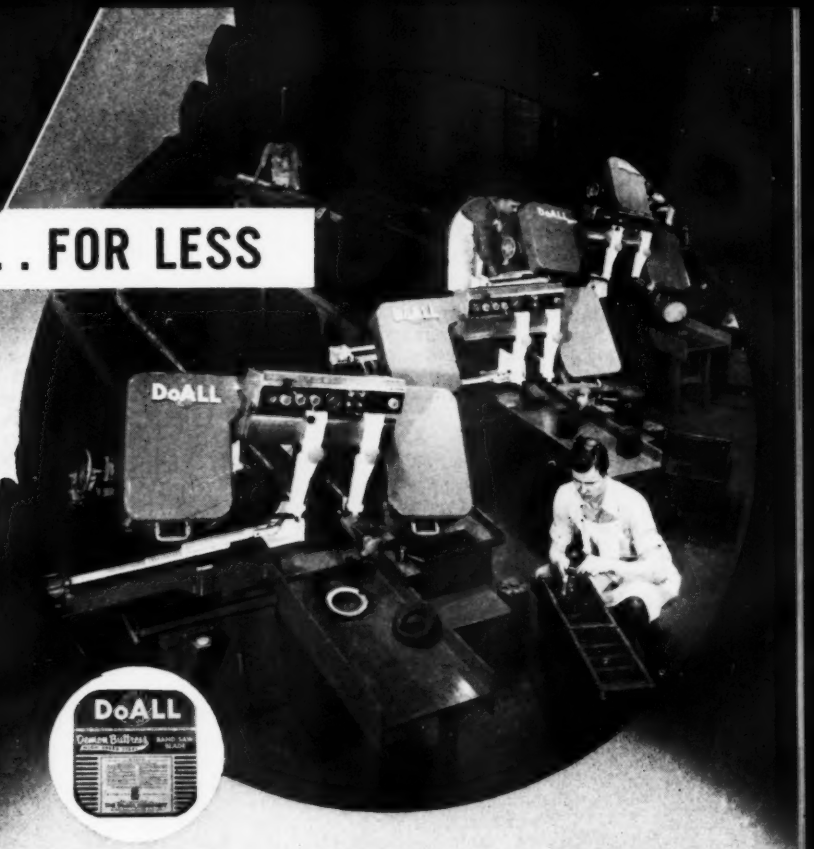
Wesson carbide cutters and boring tools are used to ensure maximum life and to hold close tolerances. In the boring of the outlet hole, accuracy is assured by piloting the tool holder in an anti-friction bearing bushing located close to the workpiece.

Adjusting screws are automatically assembled into the rocker arms for the Plymouth V-8 engine, using one of two standard Bodine dial-type automatic tapping machines equipped with tooling required for the assembly operation.

The rocker arms are hand fed to the dial, two at a time, and located in the dial fixtures in the same manner as they had been located for previous drilling and tapping operations. At Plymouth's request, carbide wear surfaces were incorporated into the fixtures and some of the locating surfaces were made adjustable in order to ensure long life of the fixtures and to take care of any minor casting variations.

Adjusting screws are automatically hopper fed from Syntron vibratory type feeders and are automatically positioned for automatic driving of the screw into the rocker arm. Screws are driven to a uniform depth within one full turn, utilizing the Bodine tapping mechanism and tapping spindles that are clutch-equipped to stop the driver at prescribed depth. Flaton clutches are used in the jack shaft to protect the tapping mechanism against overloads.

HOW TO SAW MORE . . . FOR LESS



. . . Your Local DoALL Man Will Show You

You cannot get your money's worth from a saw blade even if it's the best in the world, *unless* it is the right type for the job and is used properly.

That is where your DoALL man comes in. Here are the things he considers for you:

1. *Type of blade* — Precision, Buttress, Claw-Tooth, Friction, Demon High-Speed Steel or others.
2. *Set and pitch* — raker or wave pattern; 2, 3, 4 or more, up to 32 teeth per inch.
3. *Blade width* — from 1/16" to 1".
4. *Band tension.*
5. *Saw guide alignment.*
6. *Band speed.*
7. *Feeding rate or pressure.*

No other saw band selling organization gives you this kind of know-how and service at the local level. Your DoALL man is factory trained, widely experienced. *He works for the only company that makes both the machines and blades.*

Call DoALL — you pay no premium. You get *unconditionally guaranteed* saw bands. See classified directory for your local DoALL Store, or write:

Now get the 160-page BAND TOOL MANUAL for only $1.00 C.O.D. Formerly $2.00. How to select blades—tables—sawing terminology—it's the "bible" of bandsawing. Order yours today.

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Personalized Service . . . Complete Stocks . . . Local Delivery

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Two Intake Manifolds Are Automatically Processed on Same Machine

IN APPROACHING THE PROBLEM of processing the intake manifold for the Plymouth V-8 engine, the Master Mechanic's staff thoroughly investigated the pro's and con's of milling vs. broaching. It was decided to go to broaching as the most economical method, and because a flatter joint surface could be obtained with broaching than with milling.

A transfer-type Cincinnati horizontal surface broaching machine is used to broach the two head-joint faces and the block-joint face and one edge on the rough casting. This machine is equipped with electrical-mechanical drive and with mechanically-held carbide-tipped tools, and in other respects also is similar to the broaching machine built for the cylinder block line. The Plymouth Assistant Master Mechanic and the Chief Tool Engineer worked with the product engineers in developing a manifold rigid enough to withstand the cutting forces of the broaching action.

A transfer setup unloads each casting from the broaching machine, and positions it for loading into a Buhr multi-station transfer machine.

Conventional practice has always been to drill the angular motor mounting holes from the bottom (resulting in chips falling down into the spindle mechanism, etc.) or to turn the part over and drill from above (which leads to locating troubles). The answer to both of these difficulties is provided in the Buhr machine.

Manifolds slide on rails, being indexed from station to station by conventional transfer bar. Manifolds in the first two working stations are clamped against the rails by an overhead fixture. The fixture is pivoted and automatically indexes 45° up to bring the two workpieces into machining position (see illustration). The horizontal drills then feed in from the side, along with two carbide milling cutters that simultaneously mill the two ends of the manifold. At the same time, tools feed into the manifold being held in the second working station.

Farther along the machine, a similar arrangement swings two manifolds up in the opposite direction so as to drill the mounting holes on the other side. In fact this machine does all of the machining, except broaching, required on the intake manifolds—all the drilling, all the tapping, all the boring, all the chamfering, and all the milling.

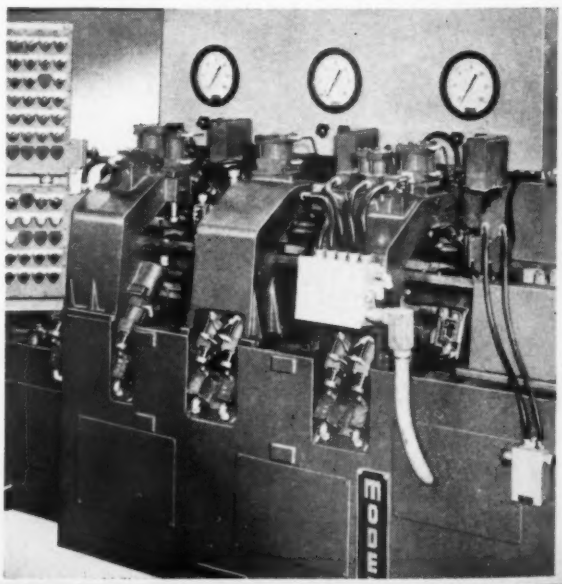
The most unusual and most valuable feature of this machine is that it is set up to machine either of two different manifolds — one for the two-barrel carburetor, and one for the four-barrel carburetor. And it will machine these two different manifolds in any sequence, automatically, without need for the operator to note which series manifold is coming through on the load conveyor. This is made possible by having a special lug cast in at one location on the one model manifold and at another location on the other model. The product engineers provided these lugs at the request of the Master Mechanic group. According to its location, the lug trips a switch that through a memory circuit actuates the proper tooling in desired sequence.

This eliminates the usual tool changes to accommodate a run of one mode and then a run of the other model. And, it eliminates any damage to tools or machine caused by a manifold coming through unnoticed with a run of the other model. Even with a choice of circuits to suit whatever manifold is being fed into the machine, leaving it up to the operator to spot the manifold, decide which series it is, and energize the correct circuits would leave too much room for error and downtime. The only satisfactory answer is the one used—the workpiece itself signalling the machine as to the operational sequence required.

The intake manifolds progress from the transfer machine through an automatic through-feed, Centri-Spray washer and into a Modern pressure testing machine. It's a three-stage setup for checking three separate passages in the manifold—the water passage, the upper gas intake passage, and the lower gas intake passage. In turn, each passage is filled with air under pressure and is checked. The machine automatically sprays paint on a part found defective at any of the three stations, the color of the paint indicating which passage was faulty. A memory circuit causes the machine to divert a defective part to where it can be inspected. If more than 5 consecutive parts are rejected as "leakers" by the machine, it automatically is shut down. If rejected parts obviously can't be repaired, they are scrapped. If they look alright, they are checked more thoroughly in a submersion-type stand.

Drilling of angular mounting holes is accomplished by horizontal drill head that feeds in after the intake manifold is elevated by pivoted fixture to the required angle.

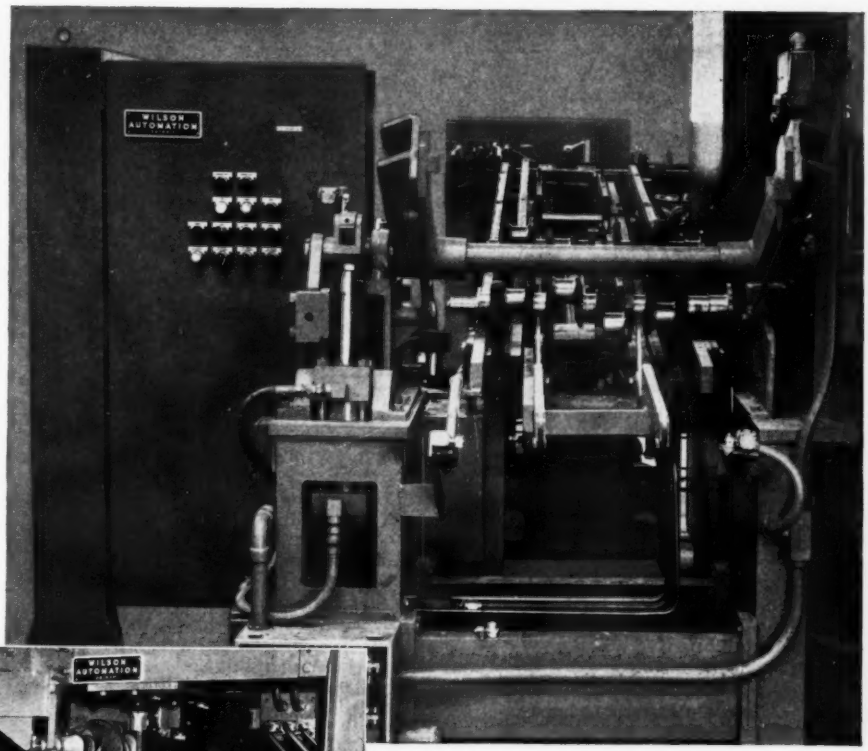
This three-stage automatic pressure testing machine checks each of the three passages in the intake manifold and color sprays and rejects any faulty pieces.

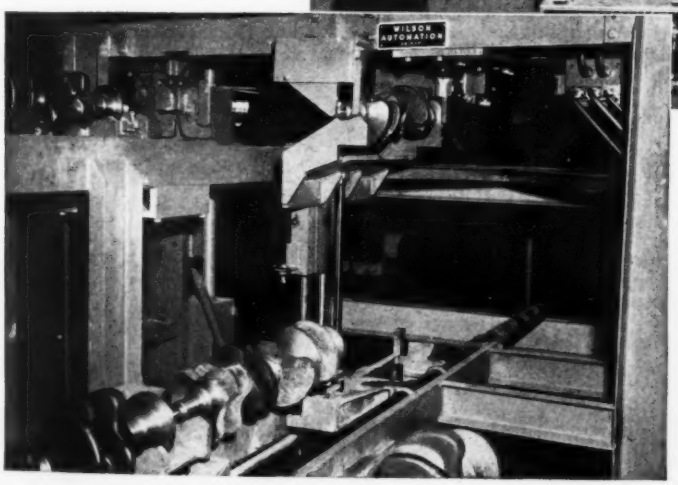


AUTOMATION by WILSON

The Wilson Automation Company is a pioneer in the building of Automation machinery and is proud to be a participant in Plymouth's Qualimatic Engine Plant Program.

A typical unload station. A Wilson double positioner for handling two crankshafts simultaneously from adjacent two-spindle LeBlond lathes is shown. Cycle of the positioner is such that broadside shuttle moves one part one increment and immediately deposits the other crank down and transfer unit indexes one more cycle. The standard Wilson shuttle in turn takes away finished crank and deposits into lengthwise feed units which in turn transfers crankshaft into next group of machining operations. Positioners and Wilson transfer units are hydraulically operated for ease in handling and electrically interlocked between LeBlond lathes and Wilson transfer units.





A typical corner intersection of the Automation indexing the crankshafts over to a common load station of the lengthwise feed unit and elevator. The parts are transferred over from the second tier and lowered into the first tier ready to be transferred into the next group of machining operations. This type of orientation is typical throughout the crankshaft machining department. The units are hydraulically operated for maximum ease of handling.

We will be glad to discuss with you how Automation can be applied profitably to your specific operations.

WILSON AUTOMATION COMPANY

PIONEER AUTOMATIONISTS

GROESBECK HIGHWAY AT E. ELEVEN MILE ROAD • P. O. BOX 3855, DETROIT 5, MICHIGAN • PHONE LOrain 8-2988

CIRCLE INFORM-A-GRAM KEY NO. 1391

Plymouth Installs 4500′ of Crankshaft Automation

THE PLYMOUTH QUALIMATIC V-8 engine plant devotes nearly 65,000 sq. ft. to crankshaft machining operations. This area is occupied by a great array of Fitchburg mills, Wickes lathes, Landis grinders, LeBlond lathes, Lo-Swing lathes, Crankshaft Machine Co. lathes, Impco crankshaft straighteners, washers, polishers, and demagnetizers, Cincinnati grinders, Snyder oil hole drilling machines, Buhr "Economatics", Olsen balancing machines, and Ex-Cell-O boring machines, along with several stations of Sheffield automatic gaging.

Most of these machines have their own built-in loaders and unloaders. The life-line of the whole operation from the Fitchburg locating-spot mills to the final gaging is the 4500′ Wilson automation system which does the transporting between machines.

The Plymouth plant engineering group, under William Allen, did not install the system in order to reduce the number of operators, but to spare them the fatigue of such weight-lifting efforts. One of the production operators told Chief Tool Engineer John Anderson that he had been grinding cranks for 23 years, and that when he came to the new plant he would try to get away from grinding cranks and get another type of job. But when he saw the new setup and that "he didn't have to fool around with a hoist or didn't have to pick them up off the floor or from racks, he thought it was a good deal and he was going to stick with grinding cranks. He was real pleased." That is a case of automation keeping a man on his job.

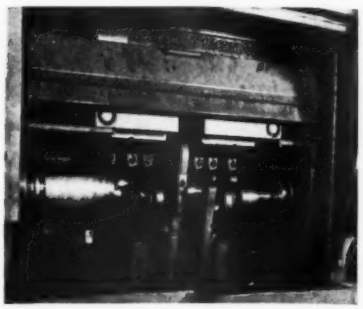
The Wilson system is charged with bringing a crank to within reach of a machine's automatic loading mechanism and then taking it away from the point of automatic unloading. It has been engineered to serve, however, a dual purpose in the Plymouth crankshaft department: it not only transports the parts, but also serves as a master coordinator. It adjusts automatically for varying machine tool production rates, and for inoperative machine tools and automation groups, in a fashion that will give the maximum possible production under all conditions.

The extent of this task is indicated by the fact that 107 independently operating machines (with varying numbers of machines at the several operations) had to be fitted into a controlling matrix of automation, in a fashion that would demand, and have the ability to utilize, their utmost in production.

To accomplish this took 144 electrical control panels with hydraulic units, and 4500 linear feet of automation composed of 385 individual units. In the face of this, Bill Allen, by introducing the concept that standardization could be applied to automation effectively on the electrical and hydraulic level, as well as the mechanical, made possible the reconciliation of low cost and high quality in automation. Wilson Automation Company applied this standardization concept throughout.

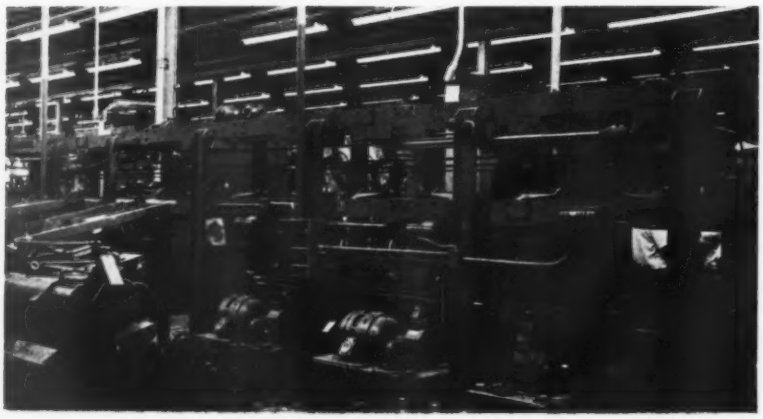
In the mechanical division there are four types of units handling the crankshafts, i.e., broadside transfer load and unload; lengthwise transfer units; turntables; and elevators. Initially, standard increments of transfer were established: one for broadside and one for lengthwise. Thus one type of hydraulic cylinder serves all lengthwise units, and another all the broadside units. This also establishes machine floor location. A standard length for each type of transfer was determined that could be used almost universally throughout the system. A few unavoidable alterations consisted of length variations only.

The electrical standardization involved analysis of and recognition of the operating conditions of each transfer unit which were common

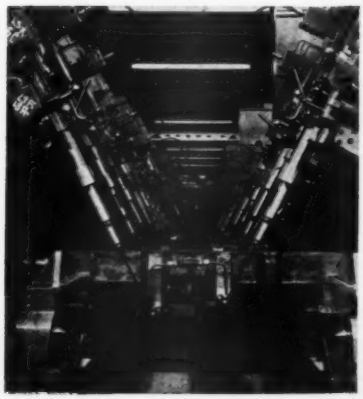


"Jackson" Type WT-6 counterweight lathes are used for turning and chamfering both sides of the six crankshaft counterweights. Six turning tools in the top slides have ¾" square Wessonmetal solid inserts. The rear slides, which carry Wesson "Multi-cut" chamfering tools, have carbide inserts which are triangular and offer six cutting edges per tool grind.

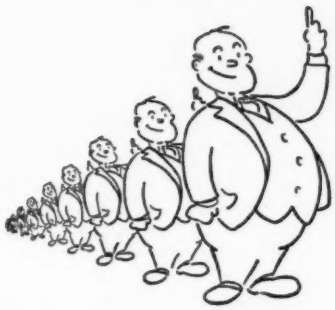
Between the automatic loading and unloading of individual machines, the Wilson Automation conveyors transport the crankshafts on two levels and by "walking beam" carriers in standard increments of travel. Note the motor and pump units, standardized per group of machines as detailed in the text.



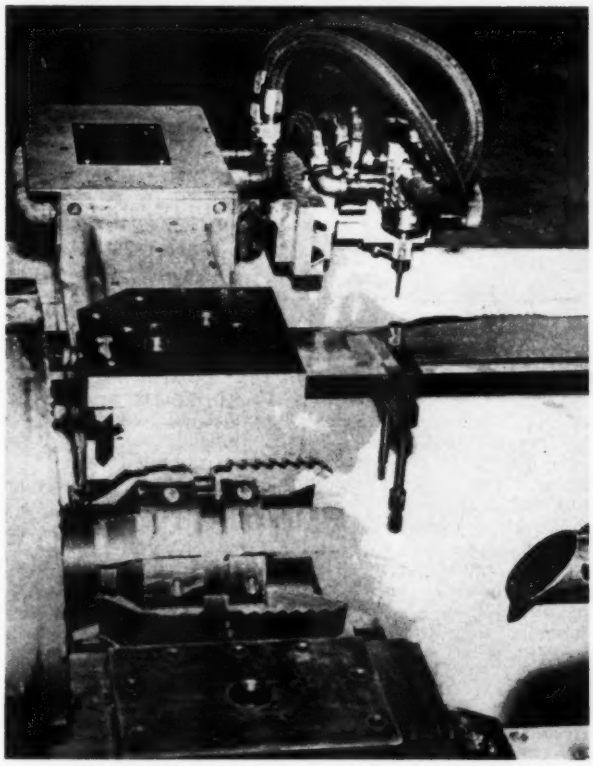
An empty station in the Snyder crankshaft oil hole drilling transfer Machine. The Snyder machines are made in 4 sections with a single transfer bar. Each drilled hole is probed by an in-process gage to insure that the hole is drilled through. In the event of an unfinished hole, signal lights indicate the location of the trouble.



TRACER CONTROLLED MACHINING APPLIED TO TURRET LATHES



Mr. Duplicator



A Walker Hydraulic Duplicator Unit on a Turret Lathe.

MR. DUPLICATOR SAYS—"I am constantly discussing threading of various parts on new types of machines. As you know it definitely is a difficult problem at times to accurately position the threads and hold their sizes in many peculiarly designed machines. This definitely is brought to light in the making of jaws that must be exact in size. The oil industry, as you know, have very difficult problems to take care of in this line of endeavor. Walker, are you doing any machining of these types of difficult jobs and just how do you fit into this picture?"

WALKER SAYS—"Yes, Mr. Duplicator, there are many jobs on turret lathes and engine lathes and milling jobs that our Duplicators have been and also now are being used to great advantage in making various parts. Witness, in photo, this peculiar looking part being accurately reproduced from a template with a Walker Hydraulic Duplicator much faster than was ever done before. This is one of the many jobs being done on turret lathes with substantial savings. In this instance the duplicating unit was put on the back of the turret lathe. Micrometer adjustments are very easily adjusted by the operator. Formed from the template; form is positioned correctly, quickly, and very easily, due to the compact design of our tracer adjustments.

Chasing a thread and pulling out fast with the Duplicator is very accurately taken care of. One user found need for not only one Duplicator to do this kind of work but later on ordered a second. In most instances job time, on turret lathes with our Duplicator, has been cut in half, even though a multiplicity of tools were used. This Duplicator pictured is our Universal Step Turning design. It is a packaged unit that can be taken from one machine to another, a change of one bracket is all that is necessary. The Duplicator pictured was moved to a larger machine later on."

The Walker Hydraulic Duplicator is entirely hydraulic. It will duplicate from a template or model. Templates do not need to be hardened. Tracers can be arranged for fast movements, on rotating types or the ones in which a spindle revolves by contact from the template. In either type the light touch of our Tracer means long template life. The Walker Duplicator is also made for boring mills and milling machines, both horizontal and vertical; planers, shapers, grinders, hydraulic grinding wheel dressers, and special machines. Our Duplicators can come as standard equipment on your new machines if you wish.

In our 25 years of building Hydraulic Duplicators for machine tools we have without a doubt taken care of jobs similar to yours. We can arrange for a demonstration perhaps in your own neighborhood. We will be glad to discuss your problems with you. Please let us know what type of a job you would like to have a Walker Hydraulic Duplicator do for you! Write or call us today! Phone: Viking 6-7871.

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Walker HYDRAULIC DUPLICATOR CO.

P. O. Box 472 STANDISH, MICHIGAN

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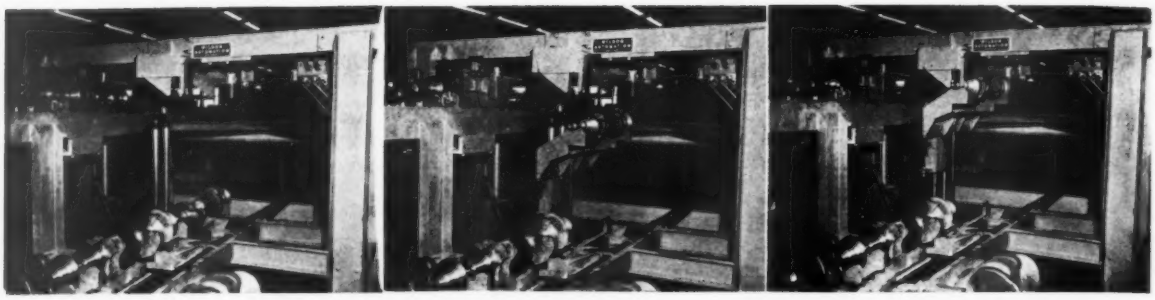


A Wilson "elevator" for handling crankshafts between levels of the automation system. From left to right, elevator shown at lower level, midway, and at uppermost level.

to all. These were found to be: (1) presence or absence of a crankshaft at load station of transfer unit; (2) presence or absence of a crankshaft at unload station; (3) carrier fingers fully up; (4) carrier fingers fully down; (5) transfer shaft full forward; (6) transfer shaft fully back; and, (7) presence or absence of crankshaft next to unload section.

Methods for signalling these conditions were made alike for all transfer units, and operating conditions were made alike for the majority of transfer units. This permitted standard circuitry in which all components in all panels and on all transfer units were identically designated. Thus, maintenance men familiar with one panel and the component designations can recognize the functions of components in all panels without reference to schematics. The savings in maintenance cost is obvious.

First in the standardization of the hydraulics for the crankshaft automation came the division of the line into groups of automation units so that in the event of a pump failure, a minimum area would be affected. Then followed the determination of the volume requirements of each group. This led to the feasibility of using a standard pump and tank unit throughout the department, with any variations in requirement being met by controls at the pump.

Finally, the grouping of two or more automation units on a single variable volume pump and electrically regulating those units to prevent simultaneous operation, resulted in nearly continuous pump operation. This reduces the peak horsepower requirements, the maximum volume demand, and the dead-head operating time.

All of this has resulted in a mixture of standardization and flexibility which would have been unattainable if standardization were planned first with a later attempt to achieve flexibility — or vice versa. But both were planned for simultaneously, with engineers from Wilson's mechanical, electrical, and hydraulic departments in constant consultation. Thus they were able to make those numerous and indispensable adjustments in basic design which ultimately resulted in both standardization and flexibility.

The flexibility thus attained can be defined as:

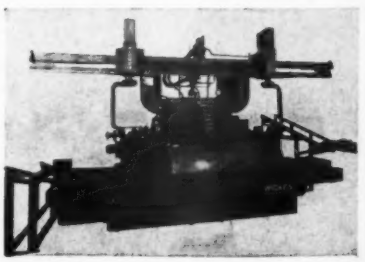
(1) the ability to continue operation with minimum loss of production despite occurrence of downtime involving machine tools and/or automation; and,

(2) provisions for the expansion of the automation into remaining manual operations with a minimum of additional expense.

Polishing of Plymouth crankshaft main bearings, pin bearings, seal diameter, and thrust face, as well as knurling of the oil seal diameter, is done on the IMPCO "Micro-Finishing" machine. The machine is completely hydraulic, and uses a walking beam type of transfer system. Emery cloth, in precision shoes which are actuated by two master crankshafts timed with the part, is automatically fed for each cycle. Used cloth is automatically rewound for easy disposal.

Thirty-four operations on 70 pieces per hour are performed on Plymouth crankshafts by the Buhr "Economatic". It performs 30 operations from the left-hand side, and four from the right, and features "Powerflo" indexing and power clamping of fixtures by means of a power wrench with torque control. The operations include drilling, reaming, spotting, and countersinking.

The Wickes lathes, Model CH-4, are equipped with power chucks, and hydraulically operated head and tail stocks, and have Wickes hydraulically operated, solenoid controlled, loaders and unloaders with loading and unloading racks. Each of the machines is tooled to rough and finish cheeks, turn, space and fillet five main bearings, and to flange end and stub end, complete and simultaneously on the Plymouth V-8 crankshaft. The fully automatic machine cycle produces 25 crankshafts per hour.



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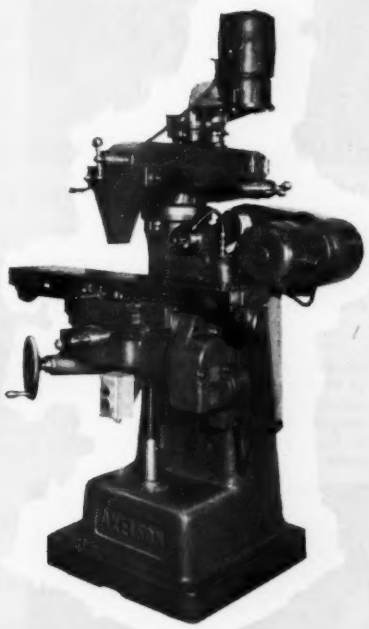

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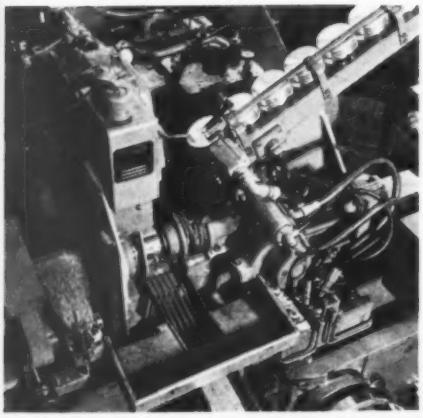
CIRCLE INFORM-A-GRAM KEY NO. 1431

Piston Production Line Features Automatic-Quality Innovations

Where piston production starts. Belt conveyor feeds four Baird six-spindle chucking machines that are fully-automatic, continuous-cycle units.



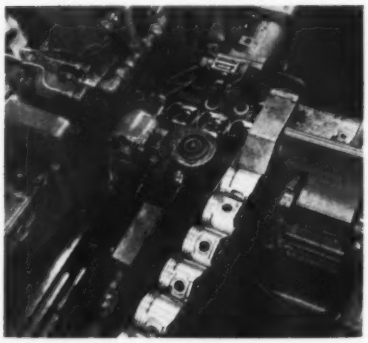
Fully automatic Cincinnati piston skirt grinder, showing Federal electronic gaging head that controls grinding wheel. Pivoted arm picks up piston at end of gravity chute and indexes it into position for chucking.

Shadograph balance scale at end of Morris weight miller doublechecks corrected weight of piston. Piston weight uniformity is critical in order to keep engine vibration to a minimum.

ONE OF THE NEATEST LINES in the Plymouth "Qualimatic" V-8 engine plant is for production of pistons. Here, partly because of the volume of pieces required and partly because of the features already available in standard machines, the process engineers decided to standardize on units, i.e., on individual machines with individual hydraulics and individual electrics. With one exception, these are essentially the same machines as have been used for years at the Plymouth main plant; however, in every instance, a greatly improved version was obtained for the V-8 aluminum pistons.

A straight-line, continuously-moving, fabric belt conveyor is the main artery along which pistons flow from operation to operation. Identical machines, in varying number, are provided for each operation or group of operations. And each machine is provided with automatic loading, automatic positioning, and automatic unloading equipment. Parts are unloaded from a machine into a gravity chute, and an elevator unit having a flighted conveyor belt carries them up onto the moving belt that takes them along to one of the machines performing the next set of operations. There, parts are deflected to whatever machine can accept them.

This type of line with continuously-cycled, fully-automatic individual machines provides more flexibility and better efficiency than would transfer equipment. In any group of machines, Plymouth can keep any number—one or more—running, regardless of what equipment is shut down. As long as at least one machine is running on each set of operations, the line can be kept running.



Pistons are designed so as to roll in gravity chutes, facilitating automatic loading. In this Heald machine a hinged cover plate keeps the last piston in the gravity chute from rolling on down. On the next cycle, a slide comes in through the guide at the right and lifts the hinged cover to release piston. Slide retracts and piston drops, hits a tip-over, and comes to rest on its dome. Piston is walked on in between rollers that turn it until contact with switch indicates it is properly oriented. In the next station, a rod is run through the wrist pin holes to verify its proper orientation.

In order to achieve this continuous work flow, the process engineers needed a piston that would roll but could still be oriented. Most pistons today have scallops on both sides and can't roll; and, with the wrist pin hole 1/16" off center, there is no way to locate them radially. So, these men worked with the engine designers to obtain a rib around the bottom of the skirt, providing a full circumference. With this, the pistons would roll and fully automatic loading and unloading became possible. The process engineers also had the designers cast a little notch in one of the ribs to pick up limit switches and provide a means of radial orientation.

The pistons start on a Baird six-spindle automatic chucking machine (of which there are four). Cycle time on this machine is only 7.93 secs/piece, the operations including rough and finish turn ring lands, semi-finish turn skirt OD, and finish turn ring grooves. The machine is set up with a two-stroke, longitudinal feed. This permits the turning of the piston OD prior to the grooving, both operations being done at the same station.

Tools used for turning the OD are held similar to form tools and are preset to a gage before mounting in the machine, thereby eliminating any cut-and-try method to obtain exact size. The solid carbide grooving tools are similarly mounted and preset to gage.

Pistons are held internally, on automatic expanding chucks permitting complete freedom to machine all details. Spindle speeds are set to provide a surface speed of 1449 fpm for free machining of the aluminum.

From the Bairds, the pistons go to a group of four Heald Bore-Matics where the oil slots in sides of oil ring grooves are milled. Then the pistons go on to a group of five Heald double-end Bore-Matics for rough boring, grooving, and chamfering the wrist pin holes after which this hole is gaged by an air gage in the machine.

Next is a group of three Heald Bore-Matics for milling the valve clearance in the piston dome, followed by a group of Heald Bore-Matics equipped with Pratt & Whitney Air-O-Limit gages for finish boring the

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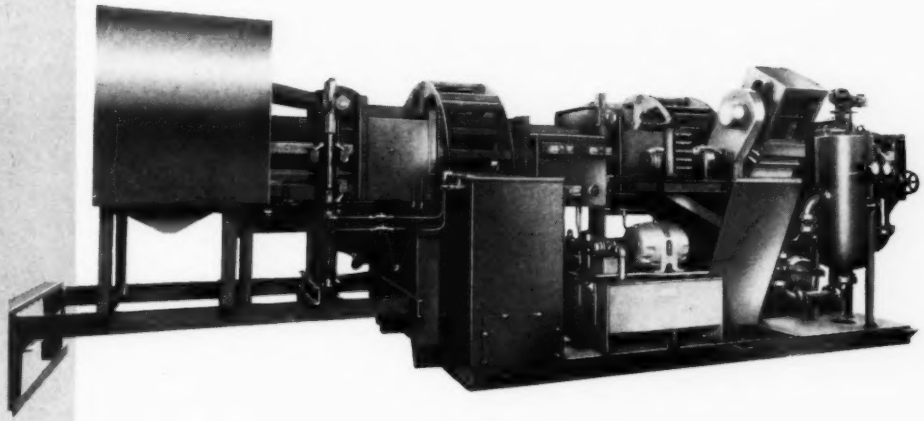

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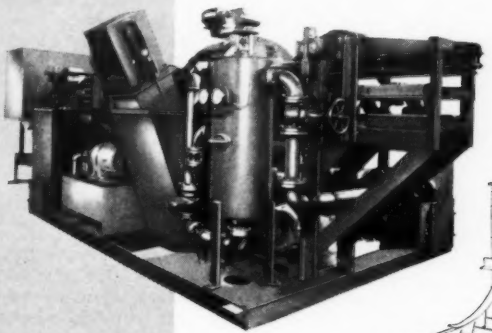

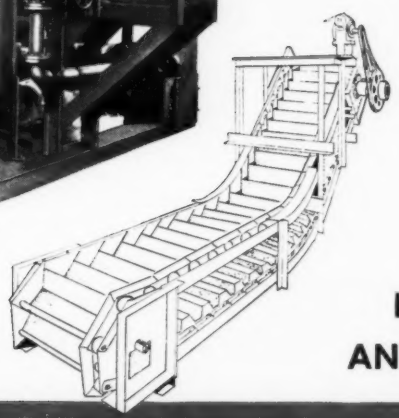

Dunk it . . . slosh it back and forth . . . hit it with high velocity water jets . . . rotate it forward and backward . . . spin it around . . . make it hospital clean and dry it. That's what happens in an IMF completely automatic engine block washer.

High velocity jets force a cleaning solution through the oil leads. Other jets clean the outside of the block. The block is rotated clockwise and counterclockwise and immersed in the solution, then rinsed. Air velocity at twenty-thousand feet per minute completely dries the block.

DESIGNERS AND ENGINEERS

IMF

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CIRCLE INFORM-A-GRAM KEY NO. 1451

wrist pin holes. Stock removed is 0.012" to 0.015", the ID being held to 0.0003".

The gaging setup on all these machines makes quality automatic. Should the gage detect a predetermined number of outsize parts, that machine is shut down automatically and the operator notified by means of a warning device. A normal reason for such a shutdown would be tool wear, necessitating a tool change.

Highlight of the line is a group of 13 Cincinnati automatic skirt grinders developed specially for Plymouth's requirements. The Master Mechanic staff had decided—due to normal impurities in the metal resulting in excessive cutting tool breakage and tool setting, and difficulty in holding size—to grind the skirt to final size rather than finish turn it as had been the conventional practice. For this operation, Plymouth wanted a highly versatile machine and one capable of extreme accuracy.

The grinder developed to their specifications features automatic loading, automatic positioning, automatic size control, automatic wheel dressing, and automatic unloading. It isn't necessary to shut the machine down except to change grinding wheels, and then the wheels are automatically balanced on the machine by means of a device built right into the machine spindle. When a wheel is put on the machine, the operator releases the automatic balancing apparatus, the wheel and spindle are balanced, and the operator locks them in position. The wheel is then dressed automatically. The machine can be set to grind to any given dimension within extremely close tolerances, to any surface finish desired, to the amount of taper desired, and to the amount of elliptical shape required.

From these machines, the pistons go to a group of three Morris weight mills. These incorporate Shadograph moment-balance scales to determine amount of stock to be removed, and at the end of the machine to doublecheck corrected weight of the piston.

Then the pistons go through a Frederic B. Stevens automatic wash, tin plate, and dry line and into two Sheffield automatic gaging and classifying machines. The first will check ring grooves and ring lands and will reject defective pistons automatically. The second machine checks the wrist pin hole for size and classifies it, checks the skirt diameter for size, stamps the piston as an A, B, C, D, or E, and segregates them according to letter.

Transfer System on 17-Station Machine Protects Critical Surfaces of Camshafts

PROCESSING OF CAMSHAFTS for the Plymouth V-8 engine is accomplished quite conventionally. A locating hole in the end of the camshaft is drilled, countersunk, and reamed on a Rehnberg-Jacobson (one-way) horizontal, 6-station, automatic index trunnion machine. Forgings are manually loaded but automatically located, clamped, indexed, and ejected. Three-spindle head is hydraulically fed from the side, with tools being piloted by bushing plate integral with each fixture on the trunnion, ensuring accuracy of operation.

Two completely automatic Seneca Falls Lo-Swing lathes are arranged in tandem to rough and finish turn and face the main bearings and the gear blank. Shafts are loaded into a magazine at tail end of first machine from which they are automatically picked up, moved into position, located, chucked, machined, ejected, transferred to elevator device, lifted into a gaging station (where Sheffield air gages measure every dimension machined and shut the machine down in the event of an out-of-tolerance part), lowered from the gaging station, transferred into a magazine feeding the second lathe . . . and the automatic cycle is repeated there.

An Impco 22-ton hydraulic machine straightens the camshaft to the required tolerance. Landis grinders rough grind the main bearings and finish grind the gear dia. Later, another battery of Landis grinders finish grind the main bearings.

A battery of Norton Cam-O-Matics rough grind successively all inlet and exhaust cam lobes, while a battery of Landis grinders finish grind the aforementioned cam lobes. In addition, the grinding wheel is trued automatically as part of each machine cycle. The operator merely loads and unloads the shafts and can attend to four machines. This is a case where automatic loading and unloading would not be justified.

After these operations, the thrust face on No. 1 bearing and the gear-fit dia. are finish ground on a semi-automatic Landis.

At one of two identical Krueger-Barnes 17-station transfer machines, all holes in the camshaft are drilled, counterbored, reamed, and tapped as required, and a keyway is milled. These machines are hydraulically actuated and were built to utilize coolant for the cutting tools, and they incorporate such features as air-oil mist lubrication for the multiple heads and Trabon automatic lubrication for all moving parts.

In operation, the transfer machine automatically picks up a camshaft from a manually loaded rack and automatically conveys, locates, clamps, and machines the part through all the various stations to an automatic discharge station.

A camshaft coming to the machine must be handled very carefully to avoid damaging the ground cam lobes and main bearing surfaces. Consequently, it is transferred from station to station by a pair of indexing bars that rotate to engage two pins and a radial locating pin into the part to carry it. This not only protects the part as it progresses but maintains lengthwise and radial location.

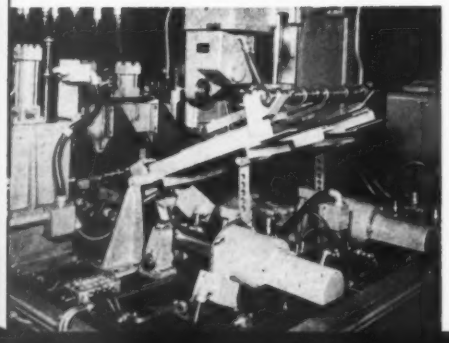
Fixtures at the working stations incorporate spring-loaded shoes to temporarily hold the part in location after the index bars have disengaged, and then vee-type clamps are actuated to positively locate and clamp the part.

At various points in the machine, radial location of the part must be changed. This is done by an automatic precision rotating mechanism that engages the centers and a hole in the end of the part after the index bars have been retracted.

At the discharge station of each transfer machine, camshafts are presented for manual loading of a Lees-Bradner vertical six-spindle machine for hobbing the distributor gear at one end of the shaft.

After hobbing, the camshafts are conveyed to an Impco straightening machine, and an automatic Bilt-Rite wire brush machine. Then they are conveyed to a battery of Landis grinders for finish grinding the main bearings, and on to a battery of Schraner machines for lapping cam lobes and main bearings.

Close-up of loading end of 17-station Krueger-Barnes machine shows dual indexing bars that rotate to engage pins in ends of camshaft, permitting its transfer from station to station without damage to critical surfaces.



PRODUCTION + INSURANCE

Most of the 400-500 machines in the "Qualimatic" production line are equipped with Trabon auto lube systems

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CIRCLE INFORM-A-GRAM KEY NO. 1471

Broaching of Cylinder Block Is First Stage in Longest Line

ONE OF THE FIRST considerations of Plymouth engineers in planning the V-8 cylinder block line was given to the question of whether to mill or to broach the flat faces required on the block.

A thorough analysis was made of the two processes. Broaching was favored by some because of its high rate of metal removal; however, various problems had been encountered with the use of broaching. Milling advancements had put that process back in the running. Complete cost studies, however, showed that from a cost standpoint broaching was still to be preferred over milling . . . even if the milling were done with the latest Rigidcut tool designs capable of feeds up to 150 ipm. Furthermore, seven or eight mills would be required vs. two broaches . . . meaning a considerable saving in critical floor space.

The engineers then turned their attention to the problems commonly associated with the broaching of workpieces as large as cylinder blocks. Hydraulic broaches had been used in recent years. Theoretically, hydraulic fluid isn't compressible; but, due to impurities, air, and water in the fluid, the great volume used in such large machines is compressible; and, when it compresses, the ram chatters and jerks. This was considered to be a major cause of tool trouble. So, Plymouth engineers concluded that they should go to planer, mechanical-type drives.

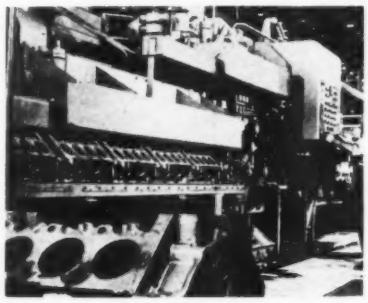
It was also determined that some of the tool trouble experienced in the past could be attributed to the machine's not having enough range to take off all the casting variations. The answer was to build the broach long enough to take at least ¼" of foundry stock.

Another factor in the success of broaching was concluded to rest in the design of a cylinder block rigid enough to take the terrific cutting forces. Working with the engine designers, the Master Mechanic group was able to obtain a block design to meet requirements.

———•———

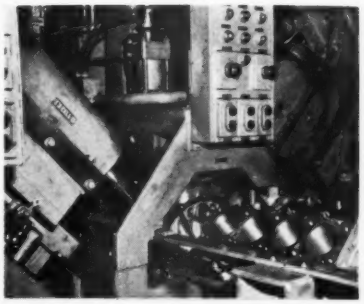
Block castings are transferred into the Cincinnati automatic two-stage broach — actually two broaching machines in tandem, both with electro-mechanical drives. There is a full automatic handling of the blocks from the beginning of the first broach to the end of the second broach.

The tooling on these broaches incorporates hundreds of individual teeth tipped with Wessonmetal, and inserted into quick-change broach sections. In order to appreciably reduce the time required for changing teeth when necessary, the Wesson Dual-Wedg Lock method of holding them is employed. By means of a differential screw, the wedge that holds the tooth rigidly in place need not be removed. The operator merely turns the screw to loosen the wedge, permitting the tooth to be removed.



On this huge Cincinnati surface broach, a cylinder block is broached on top and two bank faces as the ram moves from left to right in a 23' stroke at 150 fpm. On the return stroke, the bottom of another block is broached. A second machine broaches the end of one block and the opposite end of another block with one pass of the ram.

Among the many operations performed in the Greenlee section of the line, the eight cylinder bores are rough bored. In order to build the spindles sufficiently large to provide the rigidity required, two alternate holes in each bank face are bored in one station and the remaining ones at the next station. This permits successfully taking about 21 ipm feed, removing about 0.100" of stock, per side . . . without chatter. Solid carbide tool bits are used, rigidly clamped in large, stiff bars. The entire machine is of heavy, solid construction to ensure stable operating conditions.

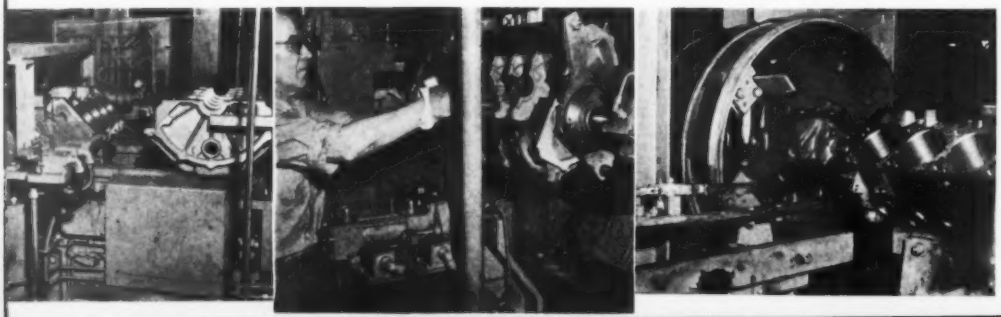


Entering the Ex-Cell-O end of the block line, the cylinder bores in the block are semi-finished, using a pattern of alternate boring to allow for large diameter, heavy-duty spindles necessary to attain the precision required.

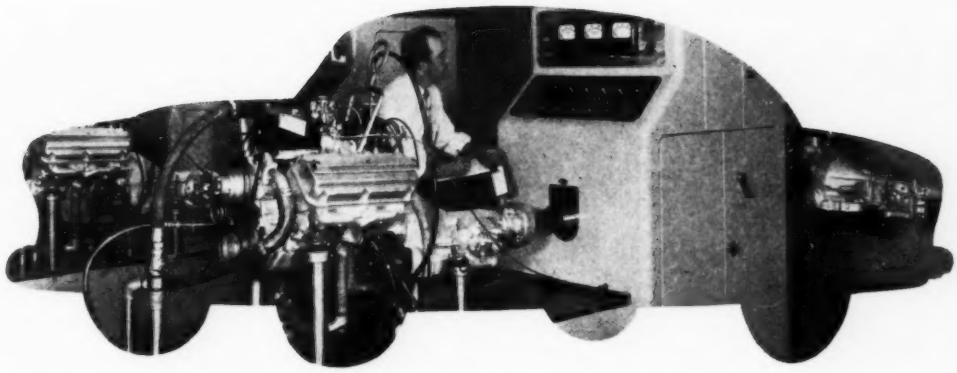
With pan face down, blocks are transferred sideways two at a time into an Ex-Cell-O machine for semi-finish line boring of five lands in the cam bore and five lands in the crank bore of each block.

At each of the two stations, the block is lowered from line of transfer down over a center bearing to within 1/32" of position for cutting. The two single-diameter boring bars move in, being guided by rotary bushings in the side plate of the machine. Keys on the bars lead the carbide tool bits thru keyways in the bushings. The bars pass all the way through the cylinder block (c'line of bar below c'line of bore in order to clear tools) to engage in bushings on the far side of the machine. The boring bar for the crank bore is also guided through the center bushing. The cylinder block then lowers through the last 1/32" and is clamped in place.

The boring bars start to rotate and, when up to cutting speed, feed in to cut all lands in both the cam bore and the crank bore. The keys on the boring bars drive the inner bearing sleeves of the rotary bushings.



Throughout the line, blocks are automatically rolled and turned as necessary in order to use the most effective and serviceable machine designs. "It is easier to turn the block than turn the machine."



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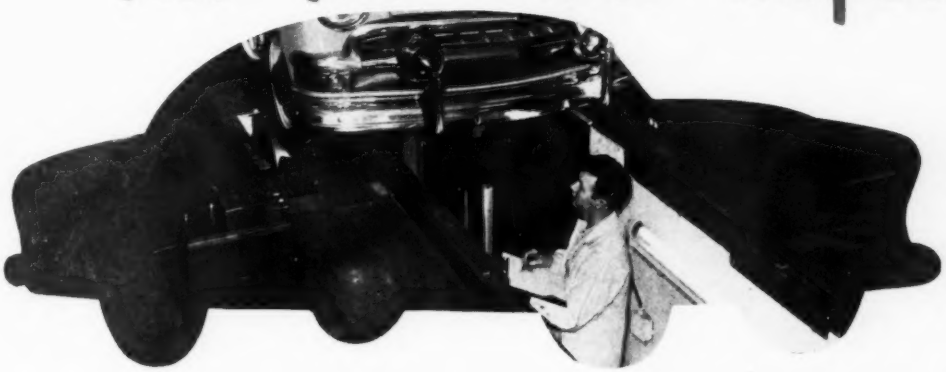
Engine Test Stand

The "NO-MILE" Inspection



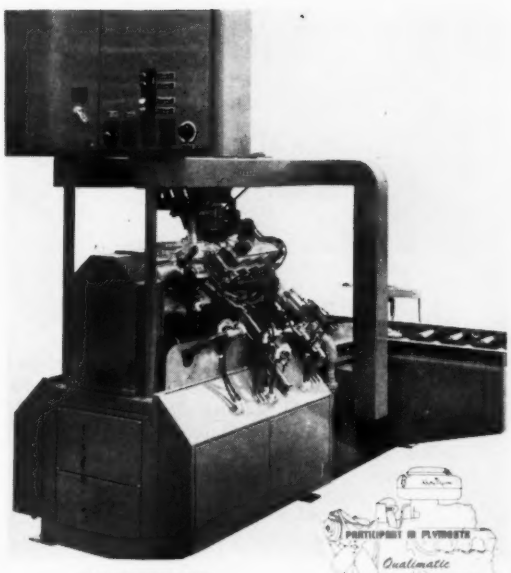
NANKERVIS
Bump Road Unit

Most of us are familiar with the 1000-mile and 2000-mile inspections our cars go through during the first few months we own them. Few of us know about the rigorous "no-mile inspection" that the factory provides.

For example, components like the starter, generator, coil, fuel pump, distributor and voltage regulator are put through their paces on accessory test benches. The engine is checked under varying loads and speeds on engine dynamometers. And, frequently, the fully-assembled car is given a work-out on a roll test and bump machine—simulating all road and load conditions even to the bumps.

Result: complete quality control.

The Nankervis Company designs and builds the equipment required for complete quality control. Illustrated are a few of many types of Nankervis test stands now being used throughout the automotive industry. When you have a testing job, call in a Nankervis representative. He'll show you a better way—at less cost.



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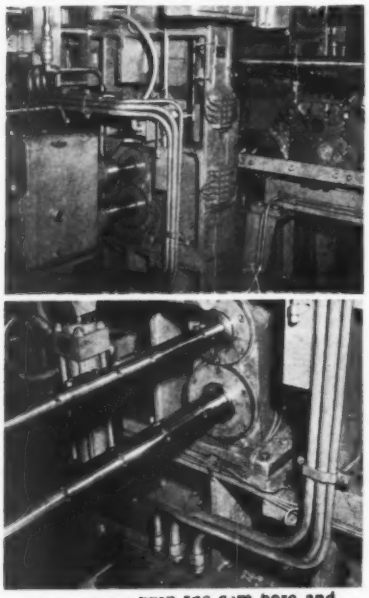
CIRCLE INFORM-A-GRAM KEY NO. 1491

When the cut is completed, bar rotation is stopped, the block is raised 1/32", bars are radially positioned with tool bits up, and bars are retracted.

Line boring in this manner means that all of the holes for the camshaft will be properly aligned, and the same for the crankshaft. It also ensures exact parallelism of camshaft and crankshaft.

Blocks are taken through various other operations and into an automatic Apex cam shell assembly machine. Each of five different size Babbit-lined bushings has an oil hole that must be aligned with the oil hole in the block. Consequently, each size bushing is fed from its own hopper down a feed track to loading position on edge. Two drive wheels, each with a small Warner electro-magnetic clutch, rotate the bushing until a pin drops into the oil hole, closing a microswitch, and stopping the drive wheel.

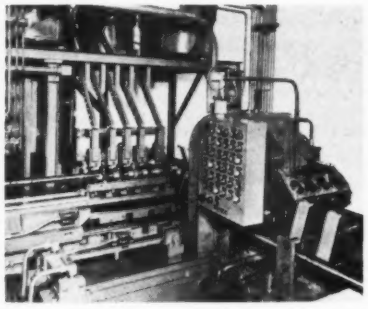


Line boring bore the cam bore and the crank bore at one time in this Ex-Cell-O ensures parallelism of the bores, and exact alignment of the five holes for the camshaft and of the five for the crankshaft.

A cam-actuated, 3-jaw type mandrel moves forward, picking up each of five bushings in turn . . . from the smallest to the largest . . . each seating against a shoulder on the mandrel jaws. At each station, the mandrel jaws expand to hold the bushing in oriented position and to disengage the pin permitting the bar to move forward again. The mandrel, with five bushings the smallest of which is at the leading end, feeds into the cam bore of the engine block to engage a "broach puller". The mandrel is then pushed and pulled to force bushings into place in the block, with a 0.004" to 0.006" press fit. Mandrel jaws are collapsed, with positive return of jaws ensured by garter springs. The mandrel is retracted, the block is transferred out of the machine and another into the empty station.

Jervis B. Webb equipment moves the blocks on down the line and automatically shunts each block into whichever of three spurs will take it. Each spur leads to an Ex-Cell-O four-way precision boring machine — highlight of the whole block line. This machine is a completely flattened one (except for a small vertical milling slide), performing at one station a number of critical operations that formerly required several clampings in as many different machines making it extremely difficult to hold the relationships required.

As the block enters the spur, a barrel device turns it on edge and it is transferred on into a loading position at the machine. It is moved over into machining position, located, and clamped. Operations are then performed from all four sides. From one direction the camshaft bushings and the crankshaft holes are line bored. From the opposite direction, two dowel holes in the rear end of the block are finish bored. From one side, the oil pump shaft holes are finish bored; from the other side, the distributor shaft holes. And, the oil pump pad is milled from above. The relationship of all these details is critical; performing all the operations without moving the part permits extreme accuracy to be attained.



Apex transfer machine automatically assembles five bearing shells into the camshaft openings in the cylinder block.

After all machining is completed, cylinder blocks move into the IMF Whirl-O-Matic washer for a thorough cleaning. A cylinder block is indexed automatically into a 6' dia. wheel divided into eight radial stations. Each station is arranged with high velocity jets that force a cleaning solution through the oil leads. Other jets clean the outside.

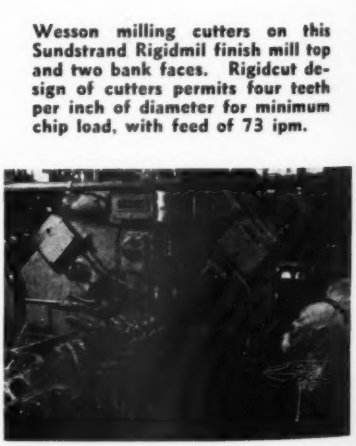
The block is rotated clockwise and immersed, with the jets agitating the solution in the tank to thoroughly clean the water jacket and all internal holes and crevices. Another block is loaded into Station 2 and the wheel is rotated counterclockwise for nine stations, placing Station 3 in position to receive the next block. The cycle is repeated until Station 1 again comes into position. The block in Station 1 is pushed out of the cleaning wheel into the rinse wheel, where the process is repeated. From the rinse wheel, the block is pushed into the dry-off station and rotated, with air at 20,000 fpm directed at all surfaces to remove the moisture.

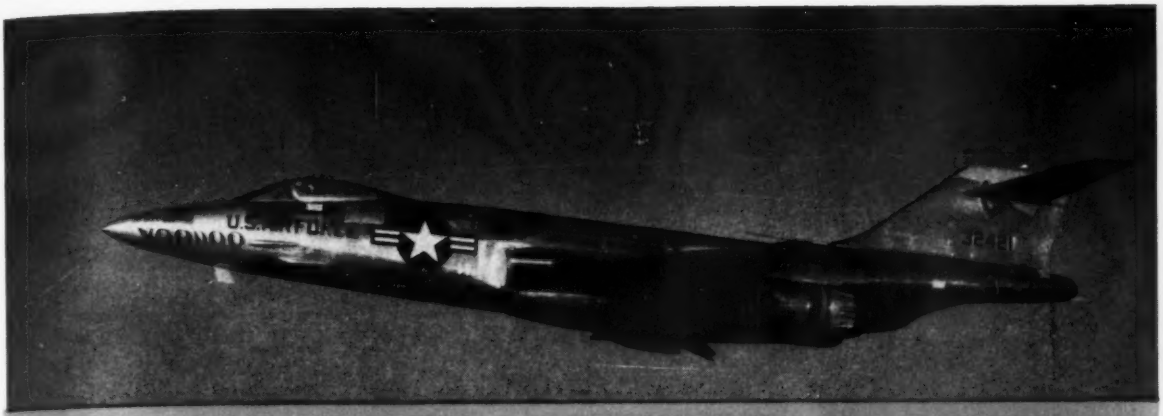
This process gives each block perhaps the most meticulous cleaning an engine block ever got to make certain that all chips and grinding dust is removed.

The two parallel cylinder block lines also incorporate Bilt-Rite qualifying fixtures, Lapointe surface broaches, Barnesdril honing machines for finishing the cylinder bores, Ex-Cell-O and Apex assembly machines, and Modern pressure testing machines.

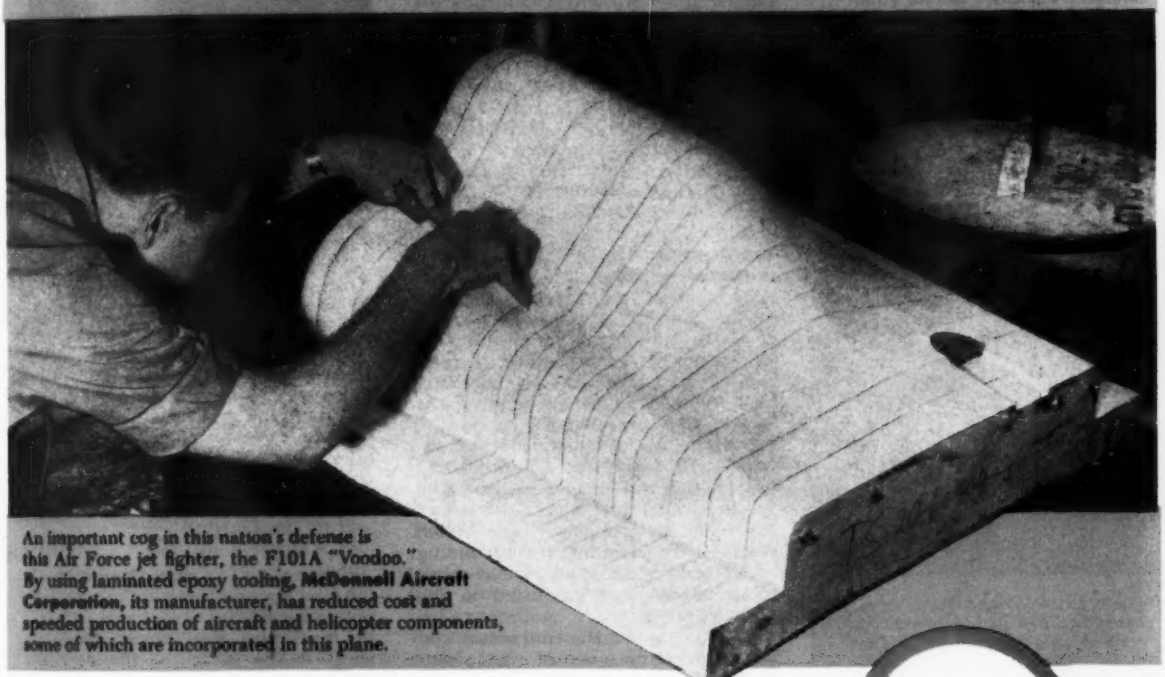
Special transfer equipment moves blocks from left to right along line shown in foreground, shunts block into whichever of three spurs will take it for feeding one of three Ex-Cell-O four-way precision boring machines. Blocks leaving the three machines go on back to a single Webb line that transfers them into a gaging station.

Wesson milling cutters on this Sundstrand Rigidmil finish mill top and two bank faces. Rigidcut design of cutters permits four teeth per inch of diameter for minimum chip load, with feed of 73 ipm.





Compounds based on BAKELITE Epoxy Resins cut production costs, tooling time!



An important cog in this nation's defense is this Air Force jet fighter, the F101A "Voodoo." By using laminated epoxy tooling, **McDonnell Aircraft Corporation**, its manufacturer, has reduced cost and speeded production of aircraft and helicopter components, some of which are incorporated in this plane.

Faster, less costly production of interchangeable aircraft components results from the advantages of BAKELITE Brand Epoxy Resins. For instance:

- Overall savings as high as 40 per cent have resulted where tools are adaptable to plastic.
- Weight of plastic tools is only 25 per cent that of similar steel or kirksite tools, 60 per cent that of aluminum tools.
- Savings in tooling-up time are as much as 40 per cent when compared with conventional tooling materials.
- Up to 75 per cent of all the interchangeable door panels used in one aircraft have been assembled and coordinated with tools made of BAKELITE Epoxy Resin—glass cloth laminates.

Epoxy plastic tooling compounds enabled this aircraft manufacturer to take advantage of the savings cited above. The compounds that are used are a product of **Ren Plastics, Inc.** (formerly Ren-ite Plastics, Inc.), P. O. Box No. 1256, Lansing 4, Mich.

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CIRCLE INFORM-A-GRAM KEY NO. 1511

Quality Control Features Dominate Connecting Rod Line

The crank end and wrist pin end of connecting rods are ground on automatic Blanchard surface grinders. The small light-colored head to the left of the operator and a similar unit at the back of the machine are for automatic size control. The unit detects any variance in the thickness of part ground and signals the magnetic clutch on the spindle to adjust the wheel.

In this Exact Weight Scale setup, connecting rods are automatically weighed and sorted into eight weight classifications, including undersize and oversize. When rod is weighed, a memory circuit is energized to open gate for shunting rod out through the proper channel.

Connecting rod caps ground on this Blanchard are automatically unclamped, and are automatically unloaded by means of device at the left which tilts a plate lifting cap out of fixture to where it will slide off the plate into a chute.

THE FIRST MACHINING OPERATION on a Plymouth connecting rod forging is the grinding of both the crank end and the wrist pin end on one side. This is done on a Blanchard four-wheel, vertical-spindle, automatic surface grinder. This machine uses two wheels to grind the crank end and two wheels to grind the wrist pin ends. A single tour around the machine completes one side of the connecting rod. A similar machine grinds the crank end and the wrist pin end on the opposite side of the connecting rod.

Like other Blanchards in the plant, these grinders are equipped for automatic size control. Each piece of work, as it leaves a finishing wheel, passes under a "wheel control caliper". If ground to correct thickness, the piece will touch the caliper shoe but not with sufficient pressure to move it. As the wheel wears, the thickness of ground pieces will increase. An increase of 0.0001" to 0.0002" is usually enough to drag the shoe, causing the caliper spindle to turn slightly and cause electrical contacts to close. Through a magnetic clutch arrangement, the wheel is fed down slightly to correct the thickness variance.

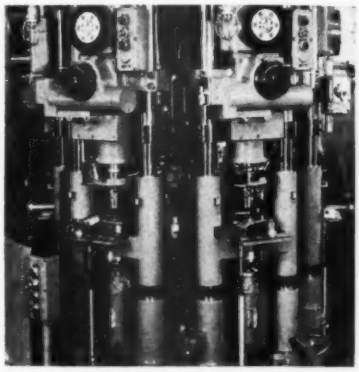
Connecting rod forgings are removed from the grinders onto a belt conveyor and carried to an automatic washer and then into a two-headed Exact Weight Scale setup. This "checkweigher", an automatic weight classifier, sorts the parts into eight weight classifications including one for those that are under and one for those that are over the range limits. The limits for any or all of the classifications can be adjusted readily. The loading and unloading mechanism is designed so that minimum impact is transmitted to the scale lever.

When weighed, the connecting rod is discharged into one of eight channels. Electromagnetic counters totalize the number of rods in each weight group as they pass through the various sorting channels. Those forgings that are acceptable are carried by a continuous inclined conveyor-elevator to an overhead storage hopper provided for each weight group. Rods are then sent through to the broaching operations in individual weight lots.

Two conventional Colonial 15-ton, 66" stroke, vertical dual ram machines broach the joint face and half round of the connecting rods. Gravity chutes empty pieces from these machines onto a slowly revolving table from which operators load two Lapointe vertical dual ram machines that broach the bolt bosses.

From these operations, connecting rods go onto a belt conveyor and are deflected into a gravity chute leading to a special Buhr dial index machine that drills and rough reams the wrist pin hole, and chamfers both sides with a recess tool. The operator manually loads this machine, but finished pieces are automatically unloaded.

From this machine, the connecting rods pass by belt conveyor to a Blanchard two-wheel, automatic surface grinder for semi-finish and finish grinding the joint face.



Automatic size control is a feature of the Micromatic machine that hones the crankpin bore of the connecting rod assembly.

Rods go on to special Buhr dial index machines that drill, chamfer, and ream the two bolt holes, mill and chamfer the lock slots, and mill an oil groove. Other special Buhr machines spotface the connecting rod bolt bosses.

Connecting rod caps start through the line by going through three Lapointe horizontal continuous broaching machines. Forgings are mechanically delivered to the fixture from a synchronized chute, are automatically positioned and clamped, and are carried by the chain-driven fixture through the broaches that size the width of the cap, leaving side faces parallel. The second machine broaches the bolt bosses and nut seats, while the third machine broaches the joint face and half round.

The joint faces of the connecting rod cap are semi-finish and finish ground on a Blanchard two-wheel, vertical spindle, automatic surface grinder equipped with an automatic unloader. Like most of the Blanchards, this machine is provided with a fixture body that incorporates in each fixture a spring-loaded plunger with roller which is actuated by a stationary central cam to open the fixture during the unloading and

loading positions. Spring pressure causes the fixture to securely clamp the part during the grinding operation.

On the joint face grinder, when the fixture clamp releases for unloading, a spherical roller on a pivoted arm contacts the unloading chute tilting the mechanism as shown in the photograph so that the cap is lifted out of the fixture and slides down the chute.

Special Buhr dial index machines drill, chamfer, and ream bolt holes in the connecting rod caps, and mill and chamfer the lock slots. Other special Buhr machines spotface the caps, which are then automatically ejected and unloaded onto a conveyor belt.

———— • ————

The Gilman Indexomatic is the first completely automatic machine ever designed and built for assembly of connecting rods, caps, bolts and nuts. The connecting rods are brought into the machine by conveyor, automatically oriented in accordance with the bearing lock groove in the bore of the rod, and placed on an indexing turret. Connecting rod caps are similarly brought in by conveyor and, in like manner, oriented to the proper position before being placed onto the indexing turret below the rod.

These parts are again checked by means of a memory system to again determine proper seating and proper orientation prior to the bolts being hoppered, oriented, and loaded into the assembly. Bolts are then pressed into position and checked for presence and position. Nuts are hoppered, oriented, and automatically loaded into two wrenches which complete the assembly by tightening the nuts to their proper torque. The entire assembly is then checked and ejected through chutes.

A complete memory system on the machine provides for automatic rejection of faulty assemblies without stopping the production cycle. The electrical system also incorporates a check for the presence of parts to be loaded, with a preset time delay should any part not quite reach the loading position when it should. The entire machine is cam actuated for positive control of all movements.

Both the crank end and the wrist pin end on one side of the assembled connecting rod and cap are ground on a Blanchard four-wheel automatic surface grinder. The step between the crank end and pin end is held to ± .001".

On the opposite side of the assembled rod and cap, the crank end only is ground. This is done on a Blanchard two-wheel machine. One wheel semi-finish grinds and the other wheel finish grinds.

A five-station special Rehnberg-Jacobson automatic indexing machine assembles bushings into the wrist pin hole of the connecting rod. The connecting rod assembly is loaded two at a time into fixtures on the dial table. The machine indexes, and hopper fed bronze bushings are oriented and pressed into the wrist pin holes under hydraulic pressure. The machine indexes, and the ID of each bushing is burnished. The machine indexes, and both extremities of the bushings are chamfered to 0.020" x 45°, using a cam-operated, two-spindle drill head. The machine indexes, and assemblies are automatically ejected.

Motch & Merryweather weight mills incorporate Toledo balance scales to indicate how much stock should be removed and to verify the corrected weight. Wesson Rigidcut mills are employed in the twin heads.

After wrist pin and crank holes have been machined on a special Ex-Cell-O boring machine, they are checked for diameter on a Sheffield unit in the machine. The rods are indexed into position and then the gaging spindles feed forward. The crankpin hole is gaged by a blade-type spindle connected to the Lectrolair unit. In the event of an out-of-tolerance part, signals will be sent to shut down the boring machine. Warning lights signal approach to oversize and undersize.

The final accuracy in the crankpin bore of the Plymouth V-8 connecting rods is generated by Micromatic Turret-Hones. These machines have six independently-operated spindles mounted on a continuously rotating table. The bores are made round and straight by floating the rods between two plates and using rigidly-mounted Micro-mold tools with automatic size control. The tool expansion pressures and compensation for abrasive wear are automatically regulated.

The operator loads the rods in the fixtures as they pass his position. The fixtures then rise, bringing the rods up over the tools. As the fixtures reach the honing position, the tool starts rotating, reciprocating, and expanding. When the bore is to the specified size, the tool expansion is stopped. After a predetermined "run-out" period, the motion of the tool is stopped and it is collapsed. The fixtures then drop away from the tool and as they pass the operator, he removes the finished rods and inserts rough parts. If a rod is not inserted in a fixture, the table continues to rotate but that spindle remains inoperative. The automatic controls eliminate all human error.

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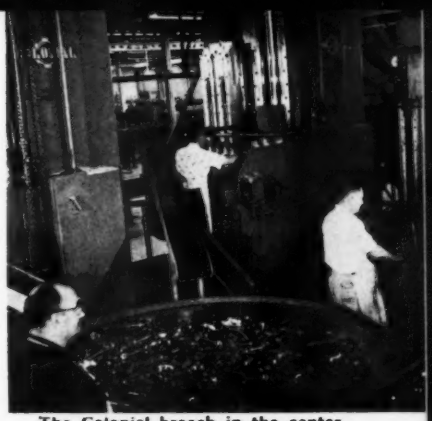
Before connecting rods are disassembled, the mating parts must be identified in order that each rod and cap that were bored as a unit later can be brought together again. This is done in a disassembly and stamping machine built by Trio Tool Co.

Both stamping and disassembly cycles are electro-mechanically controlled. A continuous tri-level cam



The Colonial broach in the center background is one of two machines that broach the joint face and half round of the connecting rods. The Lapointe broach at right, is one of two machines that broach the bolt bosses.

track governs the indexing of stamps into position. An indexing head carries 8 pairs of stamps for numbers 1 through 8 (a matched set of 8 piston-and-rod assemblies later go into one engine). The rod-and-cap assembly is mounted on split-plug locator blocks. Table slides carry it into stamping and into disassembly stations. At the latter station, (air) power wrenches controlled by an adjustable timer back off the two nuts to a predetermined number of turns. Rod and cap are then split by relative movement of main and secondary slides.

Piston, rod, and wrist pin for the Plymouth V-8 are automatically assembled by another Trio machine.

Connecting rods are manually loaded and automatically clamped in this Buhr machine for a series of operations on the joint faces. Finished pieces are automatically unclamped and ejected to a position where the operator can easily grasp them for unloading.

Connecting rods, caps, bolts and nuts are automatically assembled in this Gilman machine, nuts being power tightened.

Production Insurance Is Provided by Automatic Lubrication

AUTOMATIC LUBRICATION is much more than just another technique employed to oil and grease an automated production line. Complex automatic machinery rolls along — milling, drilling, boring, and tapping — on thousands of bearings, while performing intricate maneuvers on still more bearings. Lubrication failure at any one point can result in a burned-out bearing. Consequent downtime is costly.

Automatic lubrication provides **positive** production insurance against burned-out bearings, irrespective of the number of lubrication points, on any type or size machine. Effective automatic lubrication must "accentuate the positive". The lubrication systems employed on virtually all of the 400-500 machines in the Plymouth Qualimatic V-8 engine plant, from mammoths to midgets, are designed on this principle.

Simplicity is the byword of the systems. Standard components are used throughout: pumps—hydraulic, electric, pneumatic; reservoirs; distributor valves. The majority of the machines in the plant have been equipped with hydraulic pumps which operate from the existing machine drive. A predetermined amount of oil or grease flows from the valves by positive piston displacement.

Positive, automatic lubrication systems are provided on nearly all machines installed in the Plymouth V-8 engine plant.

Centralization of the automatic lubrication system on each machine assures maximum control of the flow of oil or grease. Installation and maintenance are simplified by using single-line type lubrication systems.

Each system incorporates **one** central indicator to notify the machine operator if lubricant is not reaching any one bearing. Maximum protection of bearings and machine from lubricant failure is effected by a pressure switch that shuts down the machine in the event of any bearing not receiving the proper amount of lubricant.

Each of the six "oilers" on each shift is a top rate machine repair man. Dan McCarthy, Supt. — Tool Division, summarizes the value of positive automatic lubrication by stating that, "Positive automatic lubrication enables Plymouth to build a better engine cheaper. Wear and tear of costly automatic machinery is reduced to a minimum. Higher quality parts are produced with lower maintenance costs."

Other Operations Worthy of Mention

Two identical Lees-Bradner six-spindle machines are used for hobbing the helical distributor gears. Both are equipped with automatic loading and unloading and also with electronic checking equipment which examines the gears after they are cut and electrically shifts the hob when necessary.

Identical work is done on each spindle, with spindles rotating past the loading and unloading position. A vibratory feeder delivers the blanks, one at a time, to a hydraulically-operated ram which seats the blank in the fixture while the hobbed gear is dropped on a small belt conveyor for transferring to the automatic checker.

The Airborne Instruments Laboratory checker inspects the root fillet of the finished gear for growth. After a predetermined number of gears have shown root fillet growth, the checker will signal the hobber to shift the hob and bring new cutting edges into action. The checker's forecasts result in much more uniform hob wear, and avoid excessive hob breakdown. The checker checks the gears from each spindle and retains in its memory the results for each of the spindles. In this manner, the signal for the hob shift is always transmitted to the proper spindle.

Installed in a power conveyor system, a completely automatic Micro-Poise machine is designed to locate, balance, and correct the flywheels, and to return the corrected work to the conveyor . . . at the rate of 125 pcs/hr.

Completely mechanized transfer within the machine moves work through three operating stations — location, balance, and correction. Handling these operations simultaneously in separate stations makes possible the high rate of production.

On this Buhr dial machine for drilling rocker arms, an electronic sensing device feeds across, as the drills are retracted, to detect by wire feelers if drills are in place and were not broken off in the hole. In the event that a feeler finds a drill missing, a signal is set up to shut the machine down until the trouble is rectified. This arrangement eliminates an extra station on the machine for the common practice of probing holes for broken drills.

The production lines in the Plymouth V-8 engine plant include numerous operations. In order to keep tool setting, tool maintenance and tool inventory problems to a minimum, milling cutters have been largely standardized throughout the plant. Interchangeability is a vital feature of the Wesson Rigidcut cutters. The blades in any fine pitch cutter are interchangeable (except for possible minor grinding variations) with those of any other fine pitch cutter. The same applies to blades used in coarse pitch cutters.

Rocker arm shafts are processed through the Snyder segmented transfer machine, which is made up of six machine units. Each has individual control panel and each is individually loaded with conveyor or magazine feed. They can be run in continuous flow pattern, or operated independently.

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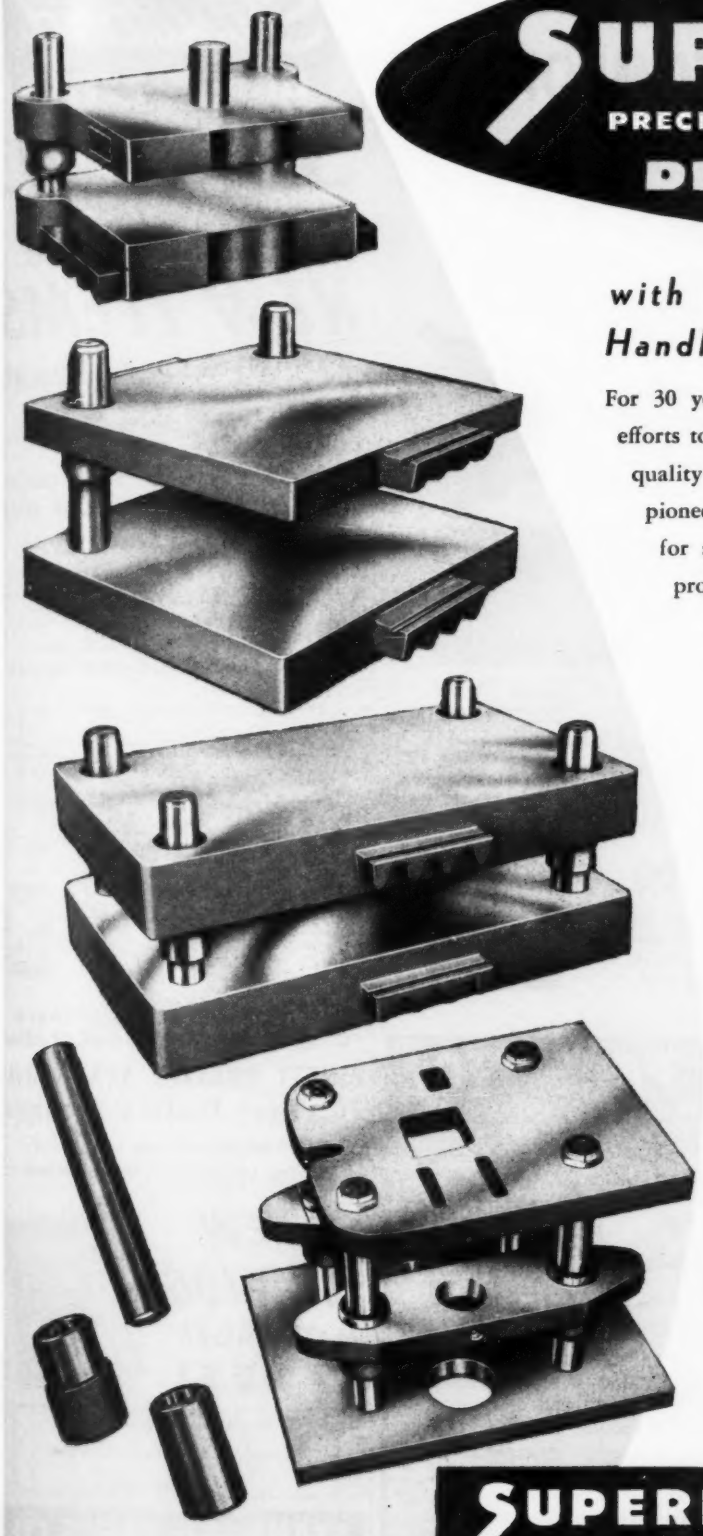

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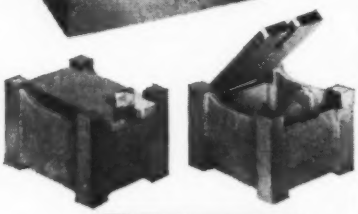

Box Jigs shown are made in either square or rectangular style in 9 sizes. Have them on hand in several sizes, use them, and watch your profits mount.

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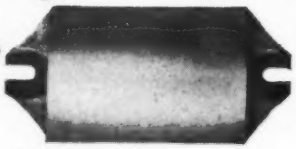
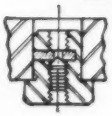
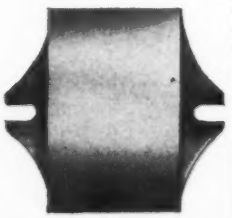


The Mill Fixture Base shown on top is available in four sizes, the Gang Mill Fixture Base in three. Both are furnished with either standard keyways or jig-bored holes for "Sure-Lock" Fixture Keys at no extra cost. These normalized bases are precision ground, parallel top and bottom with one side finished parallel to the keyways, eliminating the delay and expense necessary in obtaining patterns, castings, normalizing and machining. Ask for full scale template drawings in your size range.



Sure Lock Fixture Keys See Page 41 of our Template Catalog



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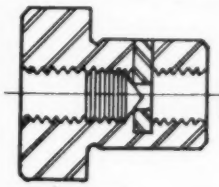

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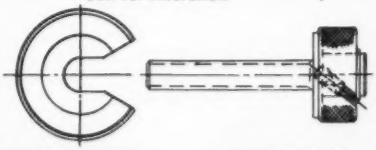

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PUBLICATION

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A New Extension Bed Gap Lathe, the "20"/40" Imperial", has been introduced by Nebel Machine Tool. With a single-speed motor, it has 18 spindle speeds, 11 to 666 rpm or 16 to 1000 rpm, and with a 2-speed motor, 36 speeds from 5 to 666 rpm or 8 to 1000 rpm. A bulletin from Nebel Machine Tool Corp., Cincinnati 25, O., tells all about the "Imperial", or —**Inform-A-Gram No. B1.**

Rapid, Positive, Accurate Indexing is performed by the patented Troyke Roto-Indexer which takes the place of expensive jigs and fixtures in connection with milling, drilling, jig boring, grinding, and slotting. Its unique block-out arrangement permits blocking out any or all of its 24 stations using only a screw driver. Complete details are found in Catalog 20 from Troyke Mfg. Co., 4422 Appleton St., Cincinnati 9, O., or— **Circle Inform-A-Gram No. B2.**

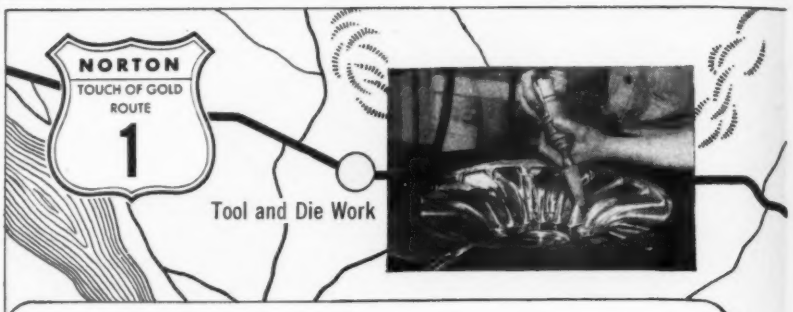
Plastic Welding and Spraying Equipment, large plastic moldings, weldments, and component parts for welded fabrications are featured in a catalog published by American Agile. Dimensions, thicknesses, I.D. and O.D. of pipe and tubing, and weights of the stock pieces of "Agilene," "Agilene HT," "Agilene IHT," and "Agilide," materials produced by the company, are detailed in charts and tables. American Agile Corp., P. O. Box 168, Bedford, O., or — **Inform-A-Gram No. B3.**

A New Wheel Dresser Extension makes it possible to produce larger radii with the standard J & S "Form Master" Angle and Radius Dresser. The concave radii range is increased from 7" to 15" and the convex, from 4" to 12", using the extension on a 7" wheel. Complete information on the "Form Master" wheel dresser extension may be obtained from J & S Tool Co., Inc., 87 Dorsa Ave., Livingston, N. J., or — **Circle No. B4.**

Cut Keyways By Hand in one minute using the money saving "Minute Man" keyway broaching system. Roughing and finishing are combined in one cutting tool. Finished surfaces can be held to close tolerances and final finishing by other means is not necessary. The brochure, "Ever Wish You Could Cut Your Own Keyways?", listing the complete line of "Minute Man" keyway broaches and kits, is supplied by The duMont Corp., Greenfield, Mass., or — **Circle No. B5.**

Safe At-The-Press Grinding is possible with the big throat Sprue grinder. This machine features a 6½" x 7" throat, built-in throat clearance bar, and a large cooling tray. It's also portable. Full details are found in the bulletin, "Big Throat Sprue Grinder," from Injection Molders Supply Co., 3514 Lee Rd., Cleveland 20, or — **Inform-A-Gram No. B6.**

Two Types of Abrasive Media for Barrel Finishing, "Honite," a natural stone, and "Super Honite," a synthetic chip, are featured in a brochure from Minnesota Mining and Mfg. Co., St. Paul 6, Minn. Also discussed are five abrasive compounds for rapid surface cutting and deburring; and rust prevention, finishing, and cleaning compounds. **No. B7.**



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They're made in nearly 200 standard shapes and sizes . . . in ALUNDUM*, CRYSTOLON* and diamond abrasives . . . in all required bonds . . . and in the reinforced BF construction. For ultra-high speed precision grinding, special spindles and cement are available.

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W-1649

PREVIEWS

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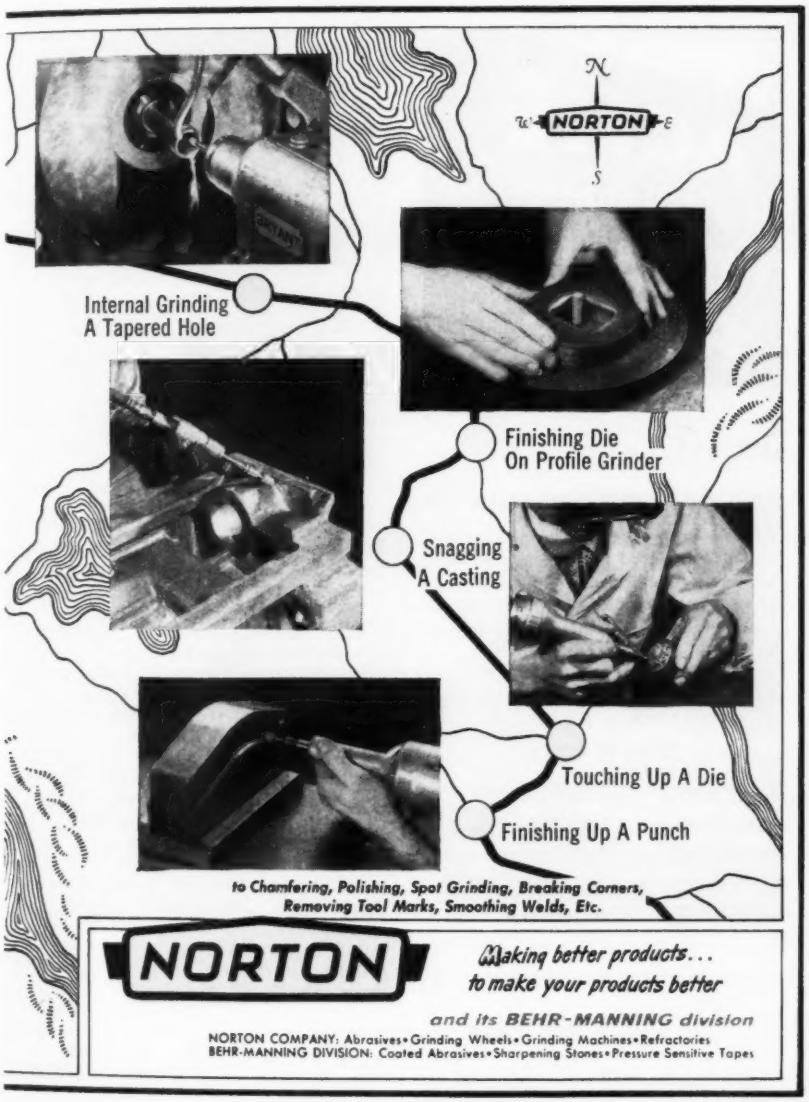
TOOLING and PRODUCTION'S Inform-A-Gram Section is a CARDload of Information

Magnetically Elevate and Convey Ferrous Parts such as nails, nuts, stampings, washers, tin cans, scrap, etc., up inclines as steep as 90°, by using Homer "Space-Saver" Magnetic Conveyors. Stationary or portable types of conveyors are available. Bulletin MC-101 from The Homer Mfg. Co., Inc., Dept. 382, Lima, O., gives full details, or —**B8.**

Economical Tube Cutting is emphasized in a new folder on the Brehm tube cutter. This machine cuts any length tube from ⅛" on up, and in diameters from ⅜" to 2¼" by changing the adaptors. Read all about it in an illustrated folder from Brehm Div'n, The Steel Products Engineering Co., Springfield, O., or — **Circle Inform-A-Gram No. B9.**



CIRCLE INFORM-A-GRAM KEY NO. 1591

A 32-Page Guide To Specialty Steels intended to help match the proper steel to the job and improve tooling, fabrication, and product performance is now available. Issued by The Carpenter Steel Co., 306 W. Bern St., Reading, Pa., it defines special purpose steels in terms of end use. It covers tool and die, stainless, and special purpose alloy steels; silicon and high nickel electrical alloys; valve, heat-resisting, and super alloy steels; tubing and pipe; and fine wire specialties. **Inform-A-Gram No. B10.**

Chromium Plated Surfaces can be free from corrosion-admitting cracks. The advantages of the Unichrome "Crack-Free" chromium plating process are outlined in a United Chromium bulletin. Comparative cross-sectional and surface views of Unichrome "Crack-Free" chromium and ordinary chromium are included in Bulletin CFC-1. United Chromium Div'n, Metal & Thermit Corp., 100 E. 42nd St., New York 17, or— **Circle Inform-A-Gram No. B11.**

Increased Production Rates, greater accuracy of work, and simplified maintenance are the advantages of two new vertical boring machines. One is a single-column 36" size and the other, a double-column 56". These machines, as well as the complete King line, are described in catalogs from American Steel Foundries, King Machine Tool Div'n, 1150-Y Tennessee Ave., Cincinnati 29, O., or — **Inform-A-Gram No. B12.**

Production Deburring and Chamfering of internal gears and splines using the "BMI-15 Burr Master" are described in a bulletin from Modern Industrial Engineering Co. Recently added to the "Burr-Master" line, this machine will handle internal gears and splines from 2" to 20" pitch dia. It features circular-type form tools, rapid changeover tooling, and a simplified operating cycle. Get copies of Bulletin 103-103 from Modern Industrial Engineering Co., 14230 Birwood Ave., Detroit 38, or — **No. B13.**

Magnetic Nut Running and Screwdriving Tools, using permanent magnets to hold nuts and screws in driving position are described in a catalog from The Apex Machine & Tool Co. Catalog 25 also contains the first published data on the new Apex "hollow-handle" magnetic hand driver. Copies of the catalog may be obtained by writing direct to The Apex Machine & Tool Co., 1037 S. Patterson Blvd., Dayton 2, O.

Tooling For Competition? Eliminate milled keyways with "Sure Lock" fixture keys, and save money. An illustrated pamphlet from Standard Parts Co., 1000 Broadway, Bedford, O., gives additional data on these fixture keys, or—**Circle B14.**

Meters to Measure the Air Consumption of any pneumatic tool, rock drill, air motor, sand blast, air lift, etc., are described in a new bulletin. The "Tool-Om-Eter" and the "Drill-Om-Eter" will determine the actual or net output and the efficiency of any air compressor or pump within their capacity. Bulletin A-8 giving full details on the portable meters, is available from New Jersey Meter Co., Plainfield, N. J., or—**Inform-A-Gram No. B15.**

A Revised, 24-Page Catalog describes the facilities and products of Stillman Rubber Co., Culver City, Calif. The company manufactures precision molded parts, thermoplastic and synthetic rubber O-rings, and hydraulic packings for industrial, commercial, and aircraft use. **Circle Inform-A-Gram No. B16.**

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CIRCLE INFORM-A-GRAM KEY NO. 1601

Steel and Brass Stamps, Type and Dies, roller dies and knurls, steel type and type holders, burning brands, and steel letters and figures are some of the products listed in a new 20-page catalog of marking devices. Complete with illustrations and type style charts for steel and rubber stamps, the catalog is available from Merkert & Sons, 146-10 Jamaica Ave., Jamaica 35, N. Y., or —**Circle Inform-A-Gram No. B17.**

"Profit From Presses" presents case histories of Diamond Machine Tool's "Multi-Max" Press. The photos explain why the "Multi-Max" is used instead of an OBI press or

large straight side press or press brake. The brochure is available from Diamond Machine Tool Co., Pico, Calif., or—**Circle No. B18.**

Surface Finishing of Stainless Steels is covered in a new Stevens technical bulletin. In addition to corrosion resistance, polished and/or buffed stainless steels have greater hardness and abrasion resistance, less thermal conductivity, and greater coefficient of expansion. The type of buffs, wheel speeds, and pressure of work against the buff are important factors in avoiding discoloration, distortion, and warping. Bulletin PP-124 may be obtained from Frederic B. Stevens, Inc., Detroit 16, or — **Circle Inform-A-Gram No. B19.**

Buschman Medium and Heavy Duty Roller Conveyors are featured in a catalog from that company. Detailed cutaway views show the dustproof, lubricated bearings with "true-labyrinth" metal seal, as well as integral and plain ball bearings, and the roller end design and construction. The rollers are made to handle loads up to 1700 lbs/roller on level lines and are made with diameters ranging from 1" to 3½". Catalog 60-A with charts giving roller and frame capacities, is supplied by The E. W. Buschman Co., Cincinnati 32, O., or—**Circle No. B20.**

Precise Circular Spacing and angular positioning are the features of Pratt & Whitney precision rotary tables. The tables will index to any angle in 360° within a few seconds of arc and are used on a wide variety of machines for drilling, tapping, boring, reaming, hole grinding, etc. Circular 558-2 gives information on each of the models. Pratt & Whitney, Div'n of Niles-Bement-Pond Co., W. Hartford 1, Conn., or—**B21.**

A Ceramic Permanent Magnet, "Indox 1," weighs only 0.18 lbs/cu. in. This low cost, non-metallic magnet is used for indicating gauges, magnetic couplings and filters, etc. Because of its high coercive force, it's adaptable to generators, motors, television focusing units, polarized relays, etc. Indox Catalog 15 describes the manufacturing process involved and lists the available types and sizes of "Indox" magnets. The Indiana Steel Products Co., Valparaiso, Ind., or—**Circle No. B22.**

Dial Indicators, dial gages, and instruments are highlighted in an 80-page catalog from Starrett. Among the models described are the new high precision, low friction dial indicators; dial comparators and bench

gages; vibrometers; etc. The illustrated catalog gives the features and physical dimensions of each, complete with specifications. The L. S. Starrett Co., Athol, Mass., or—**B23.**

No. 20 Universal and Plain Milling Machines, sliding-head type, are introduced in a bulletin from Browne & Sharpe. The wide range and versatility of the "Rangemaster" is of value to metal pattern makers, mold and die workers, and manufacturers of prototype. Its many features result in accurate machining, excellent finish, and reduced setup time. Browne & Sharpe Mfg. Co., Providence 1, R. I., will supply copies of Bulletin MM28 which contains specifications, illustrations, and descriptions of the machines, or—**No. B24.**

Deep-Throated Punching Presses are featured in Catalog P-300 from Ferracute Machine Co., Bridgeton, N. J. Specifications are given for 12"-to-42"-throat models weighing 20 to 105 tons. These presses can be adapted to punching, forming, or blanking operations. **Circle B25.**

The American Standard 20 Degree Involute Fine-Pitch System is covered in the booklet, "Fine Pitch Hobs . . . Revised." Factors which determine minimum hob radius, fine pitch hole tolerances, and hob sharpening are some of the other subjects discussed. One page of the booklet is devoted to a list of "Illinite" (R) fine pitch hobs, showing the 55 sizes and shapes which are stocked. For your copy, contact Illinois Tool Works, 2501 N. Keeler Ave., Chicago 39, or—**Circle Inform-A-Gram No. B26.**

Thorns Universal T2 Tool and Cutter Grinder is described in a new catalog. An illustrated section on its uses, in addition to the technical data, is included. Helix grinding equipment is also covered. Homestrand, Inc., Larchmont, N. Y., or —**Circle Inform-A-Gram No. B27.**

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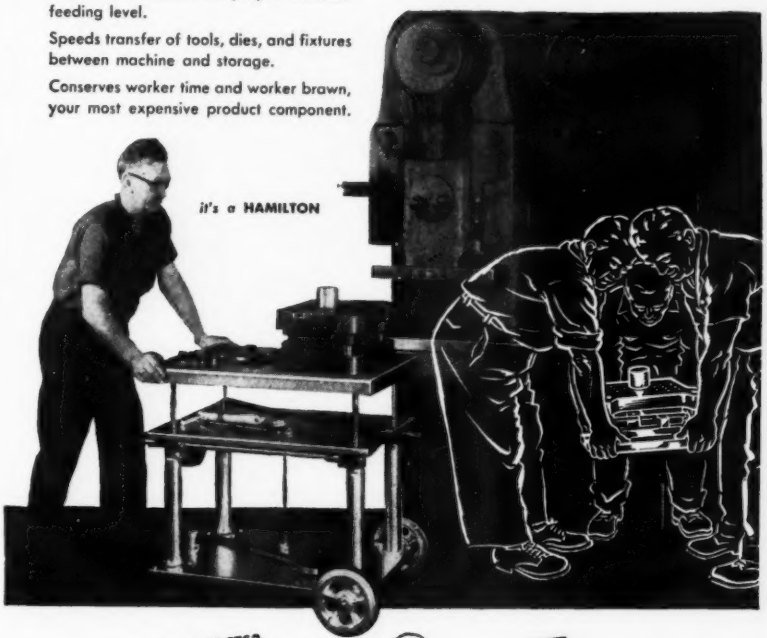

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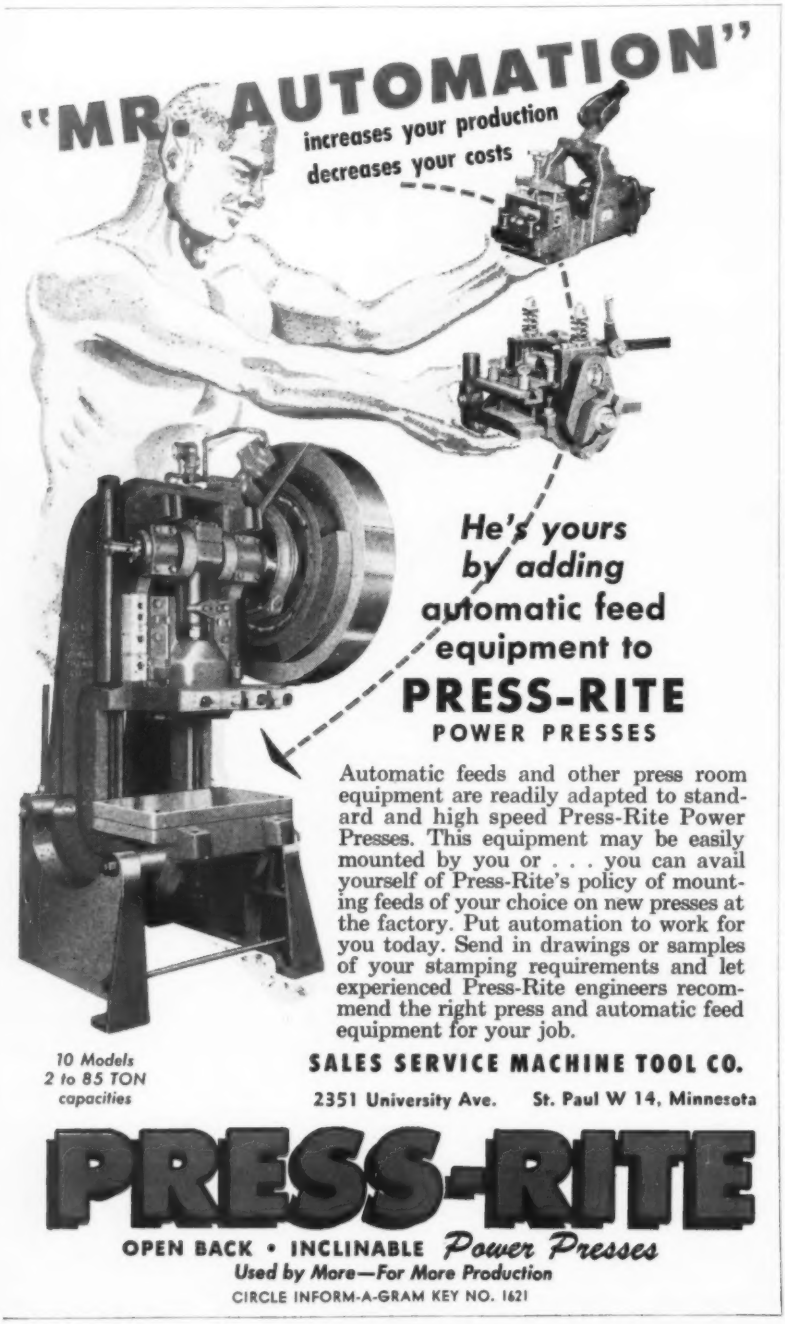
CIRCLE INFORM-A-GRAM KEY NO. 1611

Precision Cylindrical Grinders are highlighted in a catalog from Landis. The design features, photos, detailed descriptions, applications, and outline dimensions of the 10"-14" type CH plain grinders are included in Catalog B-50 from Landis Tool Co., Waynesboro, Pa., or—**Circle No. B28.**

The Line of 6-Inch Strip-Chart Recorders for pressure, liquid level, temperature, flow, and mechanical motion are presented in a bulletin released by The Bristol Co., Waterbury 20, Conn. Installation drawings and photographs of the various models are included. The use of the recorder as a receiver for remotely generated signals, pneumatic or electrical, is also described. **No. B29.**

Various Financing Plans available to purchasers of internal grinders and precision boring machines from Bryant Chucking Grinder Co., Springfield, Vt., are discussed in a folder. Also included are the types of equipment covered by the plans, length and choice of leases, option to purchase, and guarantee. **No. B30.**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Over 500 Standard Radial Ball Bearings are described and tabulated by bore size ranging from 0.0250" to 0.2500" in "Miniature Ball Bearing". Torque, speeds, and tolerances are discussed, and radial and axial play and load-life characteristics explained. This catalog also presents the company's engineering services, facilities, and quality control procedures. Copies are supplied by Miniature Precision Bearings, Inc., Keene, N. H., or—**Circle No. B31.**

A Dimensional Data Sheet for A.S.A. standard drill jig bushings has been released by Economy. Sizes and specifications are given for slip renewable, fixed renewable, and head and headless press fit bushings; headless liners; and head liners. There is also a chart giving drill sizes and decimal equivalents. Data Sheet 6-A is supplied by Economy Tool & Machine Co., Milwaukee 14, or—**Circle Inform-A-Gram No. B32.**

How A "Di-Acro" Rod Parter Cuts round, square, rectangular, and hexagon bar stock without rough edges or burr is illustrated in a 14-page manual. It points out the many types of stock that can be parted by the tool, such as cold rolled steel, brass, aluminum, etc.

Detailed operating instructions are also included along with the construction features, specifications, and capacities of the available models. Get your copy from O'Neil-Irwin Mfg. Co., 626 Eighth Ave., Lake City, Minn., or—**Inform-A-Gram No. B33.**

Precision Gage and Form Tool Work, as well as surface grinding, is performed by the Covel No. 10 Surface Grinder. It's designed to keep pace with higher speeds and greater accuracy. It uses a motorized spindle and 7" dia. grinding wheel or is available in a hand feed model. Complete information is found in Bulletin 104 from Covel Mfg. Co., Benton Harbor, Mich., or—**No. B34.**

Elmes Hydraulic Metal Working Presses and equipment are described and illustrated in Catalog 1010-C. The 150-ton pipeless hydraulic press is used for drawing, forming, and similar operations. Another machine is the 100-ton C-frame press for forcing, straightening, bending, forming, etc. Designed for forging operations is a portable, self-contained hydraulic descaler. It will handle billets 32" long and up to 6" dia. American Steel Foundries, Elmes Engineering Div'n, Cincinnati 29, O., or — **Circle No. B35.**

Tapping Perfection is achieved with the new Procunier Lead Screw Tapper. An illustrated brochure shows how each part is produced "gauge perfect" with ease. The lead

screw unit eliminates part spoilage, stripped threads, and thread distortion. Get the brochure by writing to Procunier Safety Chuck Co., 18 S. Clinton St., Chicago 6, or — **No. B36.**

A New Jig Grinding Machine has greater capacity for precision grinding and automatically positions work to ± 0.0001". This Moore-Fosdick machine can grind cylindrical as well as conical holes with grinding speeds ranging from 12,000 to 60,000 rpm. Measurements are made by setting dimensions from the blueprint on direct reading drum dials. For additional information, contact The Fosdick Machine Tool Co., Cincinnati 23, O., or — **Circle No. B37.**

Locate and Drill Holes without jigs or fixtures and laying out workpieces by using the Leland-Gifford "Hole Locator". It will perform all standard drilling operations, including drilling to depth or through, reaming, spot facing, counterboring, countersinking, etc. For a bulletin giving specifications and detailed description, contact Leland-Gifford Co., Worcester 1, Mass., or—**No. B38.**

A New Line of Air Cylinders, of square end design, has been produced. They're available in 11 bore sizes from 1½"-14" with 21 types of mountings. Catalog 110 from The S-P Mfg. Corp., 12415 Euclid Ave., Cleveland 6, contains complete details on these cylinders, or—**No. B39.**

Stones, Mandrels, and Accessories for the Sunnen precision honing machine and portable hones are included in a supply catalog. An illustration of the interlocking part numbering system for single stone solid steel and small keyway mandrels is given. Copies of Catalog XSP-5050 C are available from Sunnen Products Co., 7910 Manchester Ave., St. Louis 17, Mo., or — **No. B40.**

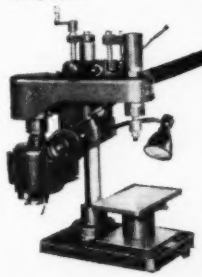
Commercial Aluminum Alloys are featured in a brochure from Peter A. Frasse & Co., Inc., 17 Grand St., New York 13. The characteristics, applications, advantages, and available size ranges of each alloy are presented. Also included are alloy designation, weight comparison, and temper designation charts. **No. B41.**

5408

precision product?

EXACT HOLES ARE IMPERATIVE!

HAMILTON VARIMATIC®
Super Sensitive
Variable Speed
Small Hole
Precision
Drilling Machine



Are you fighting the never-ending battle of trying to produce exact holes on a drilling machine which, itself, is not built to precision tolerances? You are under no necessity to do so. For the difference in price between the cheapest bench type, small hole drilling machine and the Hamilton Varimatic is reckoned in pennies per day. And the Hamilton Varimatic (holes from .004" to 5/16" in all drillable materials) is *super sensitive*. Provides speeds, *infinitely variable*, between 840 R.P.M. and 9300 R.P.M. Is built to *precision tolerances*, and with the stamina to *retain* precision.

Get prices and specifications without obligation

ASK FOR **FREE** BULLETIN 5408

Address The Hamilton Tool Company
832 South Ninth Street
Hamilton, Ohio

IT'S A Hamilton Tool
USE IT WITH CONFIDENCE

CIRCLE INFORM-A-GRAM KEY NO. 1631

Two New Anti-Friction Super Accurate Centers are introduced in a catalog from Ready Tool. The basic bearing design and engineering data on "Red-E's new shank and spindle type centers are given. Material on the high speed and carbide tipped solid centers is presented and a chart for the selection of center taper specifications covering tapers for B & S, Landis, Cincinnati, and Norton machines is included. For your copy of Catalog G-550-1, contact Ready Tool Co., 554 Iranistan Ave., Bridgeport, Conn., or—**Inform-A-Gram No. B42.**

An Optical Tap Checker produced by Hanson-Whitney is designed for checking chordal hook or rake angle. It also can be adapted for measuring flute indexing and chamfer angles. The instrument is easily adjusted for all types and sizes of taps. Both external and internal centers are furnished, in addition to a "V" block for use with taps having no working centers. Complete details are available in Folder OTC-55 from Hanson-Whitney Co., Div'n of The Whitney Chain Co., 169 Bartholomew Ave., Hartford 2, Conn., or—**Circle B43.**

Now—Lock Your Feed Rates to Protect Machines . . . Reduce Costs with the CROSS Flow Control Lock!

Only authorized personnel carry a key for the Cross Flow Control Lock! They set machine feed rate, then lock it.

Easy to install. Just remove valve nameplate and adjusting lever, reinstall over lock mounting plate.

Available for Vickers ¼" flow control valves and remote control panels.

For full details, write Dept. A710.

- **Eliminates Tampering**
- **Stops Costly Shutdowns**
- **Prevents Tool Abuse and Breakage**
- **Protects Machines Against Overloads**
- **Reduces Maintenance Costs**

Established 1898

THE CROSS CO.

DETROIT 7, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1641

Eliminate Expensive Trimming Dies and save valuable press time by using the Quickwork-Whiting Stamping Trimmer. This machine trims flash from almost any kind of stamping in a single plane. It may also handle beading and forming operations in the same or separate passes. Full details on its applications, operations, and specifications are given in Bulletin QW-123 from Whiting Corp., Quickwork Div'n, Harvey, Ill., or—**Circle No. B44.**

"Look How Savings Unfold" discusses the finishing of stamped metal parts using an airless abrasive blasting process. "Wheelabrator" blast cleaning is used to remove heat treat and mill scale, to clean prior to welding and brazing, to prepare surfaces for final finishing, and to remove

fine burrs. The bulletin complete with photos of the equipment used and performance data, presents four case histories. Copies of Bulletin 117-D are supplied by Wheelabrator Corp., 1183 S. Byrkit St., Mishawaka, Ind., or—**Inform-A-Gram No. B45.**

Almost Any Vertical or Horizontal Milling Machine can be adapted for power circular milling or indexing by using the new Knight 42" power-feed rotary table. It's self-contained and can be plugged into any electrical circuit, practically eliminating setup time. For further details, get an illustrated brochure from W. B. Knight Machinery Co., 3920 W. Pine Blvd., St. Louis 8, Mo., or—**No. B46.**

Essex Tools are featured in a bur and file catalog. Each tool is illustrated complete with head diameter and cutting length data. These tools are used with portable electric or air tools, stationary drill presses, and flexible or stationary shaft machines. Essex Rotary File & Tool Corp., 295 Madison Ave., New York 17, or — **Circle Inform-A-Gram No. B47.**

Designed for Production, Tool Room, Maintenance, and general purpose duty are the new 18" Royal Model LE Drilling Machines. They feature geared power feed electrical controls, and easy speed change. Illustrated Catalog D-136 presents specifications of the floor and bench models and lists the accessories available. Cincinnati Lathe & Tool Co., Cincinnati 9, O., or—**Circle No. B48.**

Adjustable Boring and Reaming Tools are the subjects of a catalog from The Maxwell Co., Bedford, O. These tools for an economical method of sizing bores, are manufactured in standard sizes ranging from ⅝" to 6" dia. Any Maxwell cutter may be set to size without regrinding. A grinding chart and special designs are also included in the catalog. **B49.**

Oversize, Undersize, and Correct-Size Gears can be monitored on Michigan "3-Way Classifiers". They feature an automatic gear gaging action based on point contact of individual probes. These models are used where interference from metal chips or other particles must be kept to a minimum. Bulletin 355 describes the "3-Way Classifier" and its variations, as well as the "3-Way Classifier Controller". Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, or—**Circle No. B50.**

The Features of Allis-Chalmers Package Drives for precise, wide range variable speed control are described in a new bulletin. The drive is available in five cabinet sizes with motor range from 5 to 200 hp. The bulletin contains a sample arrangement of typical package drive components and illustrations of the available units. Allis-Chalmers Mfg. Co., 1013 S. 70th St., Milwaukee, Wis., will supply Bulletin 51B8166, or—**Circle Inform-A-Gram No. B51.**

Get A Better Finish Faster by using the Supersheen "Speed Finishing" method. Almco has developed special processes for unusual parts and needs, and has set up a laboratory to solve the difficult problems which arise. For complete details and informative brochures, contact Almco Div'n of Queen Stove Works, Inc., Albert Lea, Mich.—**Circle B52.**

Ways In Which Metal Spinning can be employed to get lower production costs are suggested in Data Book 3 from Spincraft. The mechanics of spinning, range of metals suitable for spinning, spinning of expanded and perforated metal, and Spincraft fabrication and assembly facilities are some of the topics that are considered. Spincraft Inc., 4122 W. State St., Milwaukee 8, or—**B53.**

Efficiently and Economically Remove Tramp Iron and magnetic particles with super "Magnetomotive" magnets produced by Ohio Electric. These rectangular separation magnets are designed for fixed or trolley suspension over the head pulley or in a horizontal position over a conveyor belt. Illustrated Catalog 114 from The Ohio Electric Mfg. Co., 5400 Dunham Rd., Cleveland, describes the magnets, or—**Circle No. B54.**

Ease of Installation and Tooling, versatility, and precision indexing at production rates of 30,000 pieces/hr or more are the features of the Ferguson Intermittor. This high speed index table is suited for assembly, staking, testing, machining, joining, piercing, etc. Catalog 300 contains data on the 12, 18, 24, 30, 36, and 48" dial models, as well as tips on the selection of an intermittor index table. Get a copy from Roller Gear Div'n, Ferguson Machine & Tool Co., Inc., P.O. Box 191, St. Louis 21, Mo., or—**Inform-A-Gram No. B55.**

The 10R Ram Turret Vertical Milling Machine and the 10 RH Ram Turret Duplex Milling Machine are described in a new bulletin from Axelson. They're suited for making metal patterns, dies, jigs, etc. Among their patented features is the turret slide that provides a longitudinal travel of 16" for the ram and can mill in two planes. Axelson Mfg. Co., Div'n of U. S. Industries, Inc., 6160 S. Boyle Ave., Los Angeles 58, will provide bulletins containing complete information on the machines, or—**Inform-A-Gram No. B56.**

PRECISION GEARS
YOU who use small gears, (to 6" O.D. of the gear blank) can improve the performance of your product, through increased gear precision, without sacrifice of gear production.
YOU who use small, fine pitch, precision gears can increase your gear production without sacrifice of gear accuracy, or improve your gear accuracy without sacrifice of gear production.
The Hamilton Precision Gear Hobber, the hobber with a "reserve of accuracy," regularly holds work spindle and hob spindle runout to less than .0002", workspindle and tailstock spindle alignment to less than .0002", and this workmanship is maintained throughout the machine.
WANT FACTS?
Write for Bulletin No. 5419.
Address The Hamilton Tool Company
832 South Ninth Street,
Hamilton, Ohio.
IT'S A Hamilton Tool
USE IT WITH CONFIDENCE
CIRCLE INFORM-A-GRAM KEY NO. 1651

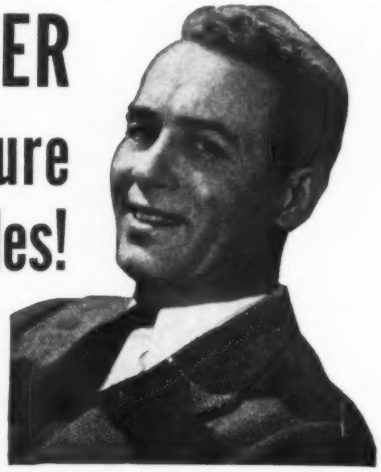
Eliminate Downtime, Increase Press Life, and assure precision punching by using Kenco punch presses. The press line ranging from 1½ to 15 tons is presented in a new folder which details the construction features. For copies of the folder, write to Kenco Mfg. Co., 5211 Telegraph Rd., Los Angeles 22, or—**Circle Inform-A-Gram No. B57.**

"Cemented Diamond Particles," a new development in diamond tools, is introduced in a circular from Koebel Diamond Tool Co., 9456 Grinnell Ave., Detroit 13. This material is composed of uniformly distributed diamond particles held in position by a Koebelite powdered metal matrix. It's used in wheel dressing tools, resulting in faster, cleaner cutting grinding wheels. **Circle Inform-A-Gram No. B58.**

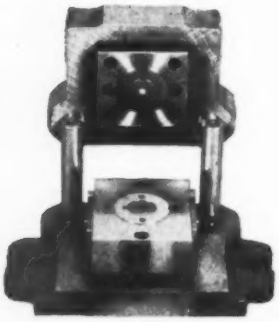
Specializing in Internal and External Grinding, machine and toolroom facilities, and honing and superfinishing, is the Martin Grinding and Machine Works, Inc., 2234 W. Walnut St., Chicago 12. A brochure from the company contains illustrations of some of the equipment used in producing small parts for the die casting industry. **Circle No. B59.**

Preliminary Design Data on the "Neg'ator" constant-force extension spring has been published by Hunter Spring. The theory, development, and general properties of this first constant-force spring are discussed. Application limitations with respect to fatigue life, tensile load, temperature, stability, and torque are presented. Fourteen design charts based on selected materials and fatigue life requirements are included in Bulletin 310-E-6-55 from Neg'ator Div'n, Hunter Spring Co., Lansdale, Pa., or—**Circle No. B60.**

"HOVIS WASHER DIES have sure solved our troubles!



"You, too, should make washers the economical Hovis way. Save time, labor, materials and storage space"



Made in 5 sizes:
¾"- 1½"- 2½"- 4"- 6"
Write for Literature

NO NEED TO MAKE A NEW DIE FOR EVERY STAMPED PART

The modern method adopted by manufacturers nationally . . . These *Patented* Dies provide a Master Holder by which, upon simply and quickly removing and replacing Five, Small Interchangeable Parts, a new size washer may be produced . . . Special sets of parts available for use in these units . . . This method makes possible production of irregularly shaped pieces and shallow draws . . . Multi-Washer Dies designed and manufactured.

HOVIS SCREWLOCK COMPANY

8100 E. NINE MILE ROAD VAN DYKE, MICHIGAN
Phone: Slocum 7-4800 Suburb of Detroit

CIRCLE INFORM-A-GRAM KEY NO. 1661

One Answer to Obolescence in single automatic screw machines is the "unit-construction" principle. The Detroit Screwmatic 750 which is composed of ten units, was developed on this principle. As improvements in the units are introduced, they may be purchased individually and installed. Read all about the new principle and Detroit Screwmatic 750 in an illustrated six-page folder from Gear Grinding Machine Co., 3901 Christopher, Detroit 11. **Circle Inform-A-Gram No. B61.**

New Tool Holders for "throw-away" carbide inserts are covered in a catalog recently issued by Carboloy. Also illustrated are the seven styles now manufactured by the company. The publication discusses the grades, styles and specifications of "throw-away" insert blanks used with the new and standard holders. Catalog GT-293 is supplied by Carboloy Dept., General Electric Co., Detroit 32, or—**No. B62.**

Cushion Helve, Upright Helve, Upright Strap, and Compact Hammers are covered in a new catalog. These hammers have many uses in the hot and cold forging and forming of metals. The catalog contains a history of these operations explaining the usage, past and present, and giving specific applications of Bradley hammers. Specifications and descriptions of each of the four types are also included. Catalog 155 is available from C. C. Bradley & Son, Huntington Ave., Cortland, N. Y. or —**Circle Inform-A-Gram No. B63.**

A Single Spindle Automatic Screw Machine can be converted to a chucker by substituting a chucking attachment for the bar feed assembly. It has electric feed control, increased spindle speed range, and quickly changed collet pads. Details on "Dialmatic" Model AB are given in a booklet complete with charts and diagrams, from The Cleveland Automatic Machine Co., Cincinnati 12, O., or—**Circle No. B64.**

Finishing Recommendations are found in "Successful Stevens Laboratory-Verified Finishing of Aluminum and Zinc Base Die Castings". Suggestions on type and size of buff or wheel, minimum number of operations required, wheel speed, necessary abrasives or compositions, etc. are included. Also explained are the L.V. Report Services available for determining methods and materials that will reduce finishing costs and improve the final finish. Get Technical Bulletin PP-125 from Frederic B. Stevens, Inc., 1800 18th St., Detroit 16, or—**Circle No. B65.**

New Four-Way Dual and Single Solenoid Valves are designed for safe and dependable control of double-acting pneumatic or hydraulic cylinders. They'll operate in air, gas, water, or hydraulic fluid from 10-500 psi at speeds up to 850 cycles/min. Specifications and flow diagrams of both valves are given in Bulletin V5003 from Automatic Switch Co., 391 Lakeside Ave., Orange, N. J., or—**Circle No. B66.**

Drilling, Tapping, and allied operations are handled by automatic power-driven "Cam-Matic" drill units. A 12-page catalog contains photos, line drawings, descriptions, and specification charts on two models, including three types of drive arrangements and three mounting positions. The rheostat-controlled electric clutch drive mechanism which permits automatic thrust control, is also shown. One section enables the reader to trace the operational action of the unit. Copies of Catalog 92 are available from The Morris Machine Tool Co., 933 Harriet St., Cincinnati 3, or—**Circle B67.**

"Tru-Loc" Adjustable Adapters are featured in a folder from Economy Tool & Machine Co., Milwaukee 14. The folder contains tables giving the body and nut specifications. A part number conversion chart is also included.**Circle No. B68.**

Roller Gravity, Wheel, Belt, and Live-Roll Conveyors are featured in "Lamson Conveyor Facts". The catalog describes and illustrates the uses of the various components. A method of analyzing loads as to weight distributions and grades is also presented. One section contains simple charts for figuring conveyor lengths and load friction losses from inclines. The catalog is written in terms of when to use the units, rather than what they are. Copies are supplied by Lamson Corp., Syracuse, N. Y., or—**No. B69.**

Open-Back Inclinable Power Presses, 2-ton — 85-ton capacities are highlighted in Bulletin 855. The features, descriptions, and specifications of the complete line of "Power-Right" power presses are given. Get Bulletin 855 from Sales Service Machine Tool Co., 2363 University Ave., St. Paul 14, Minn., or—**Circle B70.**

Hydraulic Die Handling Trucks with 10,000- to 80,000-lb capacities are highlighted in a four-page folder. They feature hydraulic pushoff for accurate die positioning and the "Rolotac" travel controller. The folder containing design and operating information is available from The Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 3, or —**Circle Inform-A-Gram No. B71.**

Thrust Above the Ways near the tool load is a feature of new way-type hydraulic feed units. The flange is designed to simplify mounting and aligning of multiple heads at assembly. Technical data and diagrams of Models 405 and 410 are found in single-page Flyer 501 from The Hartford Special Machinery Co., Hartford 12, Conn., or —**Circle Inform-A-Gram No. B72.**

"Martin Grinding Manufactured these for Doehler-Jarvis!"

Betty, the Martin Girl, is holding a sprue bushing 2" long with a 2" O. D. x 1½" I.D. All tolerances held within .0005 of an inch.

This represents just one of the smaller parts made by Martin Grinding and Machine Works for the die casting industry.

Alongside Betty, is one of the larger parts manufactured complete by Martin Grinding for Doehler-Jarvis. Dimensions of sleeve are as follows:

LENGTH—36"
O.D. — 8"
I.D. — 3½"

It has been made from one of the better grades of hot worked steel, which in turn was hardened, ground and nitrided for longer life. It is then polished to fit the mating part as specified by the customer.

Just goes to prove that big or small Martin Grinding and Machine Works can furnish you with the best.

We welcome all inquiries re: the reconditioning of cold shot sleeves and goosenecks as well as the complete fabricating of same.

Send for Brochure and facility list. Dept. R2

Martin grinding and machine works inc.

2234 W. Walnut St. Chicago 12, Illinois SEeley 3-2154

CIRCLE INFORM-A-GRAM KEY NO. 1671

MEN YOU SHOULD KNOW

Arthur J. Zwanzig is now assistant to the vice president and general manager of Alloy-Precision Castings Co. He was associated with American Electro Metal Corp. as chief engineer.

Kearney & Trecker Corp. announced the appointment of **J. Robert Jones** as general sales manager. The company also recently established an Aircraft Machine division with **John R. Joerger** as sales manager.

F. J. Sikorovsky has been appointed general manager of the Tap Division of Wood & Spencer Co., Cleveland, according to an announcement by **F. H. Wood**, president. For the past five years, he's been executive vice president of Avildsen Tools and Machines, Inc.

Two new vice presidents at Warner Electric Brake & Clutch Co. are **Norman K. Anderson** and **King DeSeve.** Anderson joined the company in 1946 and DeSeve in 1951.

Dr. Seymour Geisser, a mathematical statistician, has joined the Applied Mathematics division of the National Bureau of Standards. He'll serve on the staff of the Statistical Engineering Laboratory.

A. B. Willemin was appointed planning superintendent and **J. B. Organ** will be his assistant at the Dodge Truck Plant of Chrysler's Dodge division.

J. N. Wolfram recently became engineering manager of The Parker Appliance Co. He joined the company in 1932.

The election of **E. S. Russey** and **A. W. Rose** as vice presidents of Borg-Warner Corp. was announced by **Roy C. Ingersoll,** president and chairman of the board.

George H. Garraway will serve as director of manufacturing at The New York Brake Co. He'll be responsible for organization, policy, procedures, and planning for all manufacturing.

The new manager of the electrical section of Allis-Chalmers Norwood (Ohio) Works is **George A. Saar. Ray R. Walther** will serve as general manager of that plant.

Frederick C. Kroft has been appointed general superintendent of manufacturing for Haynes Stellite Co., a division of Union Carbide and Carbon Corp.

Carl J. Meister has been named executive vice president and assistant general manager of the Atkins Saw Division of Borg-Warner Corp.; **Robert M. Zimmerman,** vice president-manufacturing; and **Howard O. Wiesen,** vice-president-administration.

Marshall C. Battey has joined Sargeant & Wilbur, Inc. as the New England sales representative. He was formerly a sales engineer for C. I. Hayes.

Alexander S. Keller will rejoin Niles-Bement-Pond Co. as vice president of Niles, of which he's a director, and as general sales manager of the Pratt & Whitney Division.

Three promotions have been announced by The Torrington Co. **Donald E. Lewis** will become sales manager of Bearings Division; **Robert A. Clarke,** sales manager of Swaging Machines and Surgical Needles Divisions; and **Richard S. Keppelman,** sales manager of Specialties Division.

Now See the Entire Collection of

"Award-Winning" Kling Metal Fabricating Machines in this New Bulletin 100

In the new Kling Bulletin you will find illustrations and data representing over 50 Kling Machines. These versatile machines, performing scores of metal-working operations, are winning "Production Oscars" for thousands of companies throughout the world. It is the increased production . . labor-saving . . . cost-cutting results from Kling machines that account for their increasing use in "the best of companies." Such results as shown here* can be yours. We will be glad to send you a list of users in your industry, along with your free copy of the new Complete Line Bulletin 100. Why not send for it today?

A **KLING DOUBLE ANGLE SHEARS** *One Chicago manufacturer reports that this machine is cutting his labor costs 75%

B **COMBINATION SHEAR, PUNCH & COPERS** *A large railroad shop reports that this "jack-of-all-jobs" gets 16 hours' work from an 8-hour shift

C **HIGH SPEED FRICTION SAWS** *A famous midwest manufacturer reports that one of these saws cuts 1000 to 1300 channels, angles, round and flat bars, every 8-hour day

Since 1892

Kling BROS. ENGINEERING WORKS
1320 N. KOSTNER AVE. • CHICAGO 51, ILLINOIS
Makers of Friction Saws; Shears—Rotary, Double Angle and Guillotine; Punches; Combination Shear, Punch and Coper; Angle and Plate Bending Rolls; Bulldozers.
Export Distributor: Simmons Machine Tool Corp. 50 E. 42nd Street, New York 17, N. Y.
997TE

CIRCLE INFORM-A-GRAM KEY NO. 1681

MEN YOU SHOULD KNOW

Two executives for the Die Supply Division of E. W. Bliss Co., in Cleveland, have been named. **Carl J. Theken** will take over as manager and **Edmund M. Brumagin** as sales manager. In addition, the company announced that **B. E. Meyer** will fill the newly-created position of general service manager of the main Bliss plant in Canton. Mr. Meyer formerly was the company's Chicago district sales manager.

Charles J. Wallace is the new vice president and general sales manager of Houdaille-Hershey of Indiana, Inc. He's had experience in almost every phase of the filtration industry.

Clark Controller Co. of Cleveland has named **David C. Wycoff** as manager of the Product Adaptation Department to direct the testing of new products and readying them for manufacture. He formerly was manager of the company's experimental laboratory.

Gilbert A. Bunn has been placed on special management assignments at the home office of Kennametal Inc. in Latrobe, Pa. **Bennett Burgoon, Jr.** has been appointed sales manager of Kennametal Inc., according to **Alex G. McKenna,** executive vice president.

Howard C. Gebhart has been named chief engineer of Rockwell Mfg. Co.'s Delta Power Tool Division plant at Bellefontaine, O. He formerly held the same position at Kett Tool Co. He'll succeed **John B. Unterweger** who was promoted to factory manager.

R. E. Bastian has been named manager of the Mechanical Building of The Firestone Tire & Rubber Co., according to an announcement by **H. H. Waters,** director of engineering. He succeeds **John A. Hansen** who recently retired.

Edgar W. Engle has joined the technical staff of Fansteel Metallurgical Corp., as assistant to the technical director. He has been active in metallurgical engineering in the field of the refractory metals and their carbides and alloys.

Robert B. Butler is the new manager of the AiResearch Industrial Division of The Garrett Corp., manufacturer of turbochargers for Diesel engines.

George E. Ellis will take over as general sales manager of Lipe-Rollway Corp. He was formerly manager of the Modern Tool Works Division of Consolidated Machine Tool Co.

Carl F. Roby has become president of The Heald Machine Co., newly-acquired subsidiary of The Cincinnati Milling Machine Co. He had formerly been a vice president and director of the parent company.

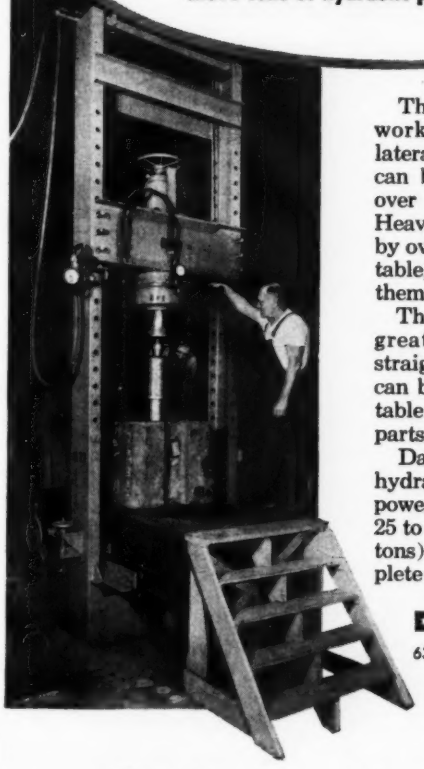
C. S. Wiedman has been appointed manager of carbide products development engineering for Carboloy Department of General Electric Co. He'll be responsible for directing the metallurgical development of carbide materials and related processes.

Herman Plone will head the engineering activities at the new enlarged plant of Aircraft Standards, Inc. in Santa Monica. He has had 18 years experience in the engineering and tooling phase of the aviation industry.

John F. Bergman has been appointed national sales manager of the Punch Division of Pivot Punch and Die Corp. He'll supervise the division's sales, factory servicing, and technical education activities.

Designed for awkward, heavy hard-to-handle pressing jobs

With this Dake Movable Frame Press you can move tons of hydraulic power over your work.



The frame moves lengthwise over the worktable, and the workhead moves laterally along the frame. Thus the ram can be placed anywhere it is needed over the extremely large work area. Heavy, awkward parts can be moved by overhead crane or hoist to the worktable, and the power centered above them.

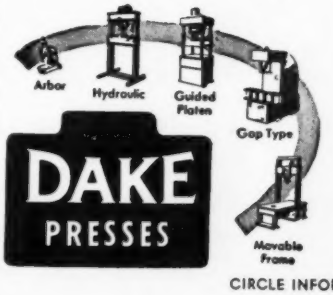
The extra large table area gives a greater capacity for bending and straightening work, too. Support points can be spread to extreme edges of the table for long or irregularly-shaped parts.

Dake Movable Frame Presses are hydraulically operated, and may be powered either by air (in capacities of 25 to 150 tons) or electricity (25 to 300 tons). Write for Bulletin 269B for complete description and specifications.

DAKE CORPORATION

634 Seventh St., Grand Haven, Mich.

Pressing the battering point into the hammer of a pile driver with a Dake Movable Frame Press.



Send for Big New Catalog

DAKE CORPORATION
634 Seventh St., Grand Haven, Mich.

Please send me a copy of Dake Bulletin 269B

Name_____

Company_____

Address_____

City_____ Zone____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 1691

V. G. Mulligan has been appointed general sales manager of Driv-Lok Pin Co. The firm produces metal fasteners for the automotive, agricultural implement, appliance, and machinery manufacturing industries.

D. K. Wirth will be the branch manager of the new Detroit Industrial Lift Truck Sales and Service branch of The Yale & Towne Manufacturing Co. He was formerly president of Michigan Materials Handling Corp. In charge as sales manager for the new branch will be **John R. Henderson.**

R. D. Friedlander will serve as general sales manager of Diesel Energy Corp. He'll be in charge of U. S. sales for all products of Kloeckner-Humboldt-Deutz A. G., Cologne, Germany, which are imported by Diesel.

Gaertner OPTICAL INSTRUMENTATION

TOOLMAKERS' MICROSCOPE

READS TO .0001"

DIRECT COORDINATE MEASUREMENT

PLUS - - -

THESE LISTED FEATURES MAKE THE TOOLMAKERS' MICROSCOPE AN ALMOST INDISPENSABLE INSTRUMENT IN YOUR SHOP OR LABORATORY.

Range 2 x 4 Inches

360° Stage Rotation
Reading To 1 Minute

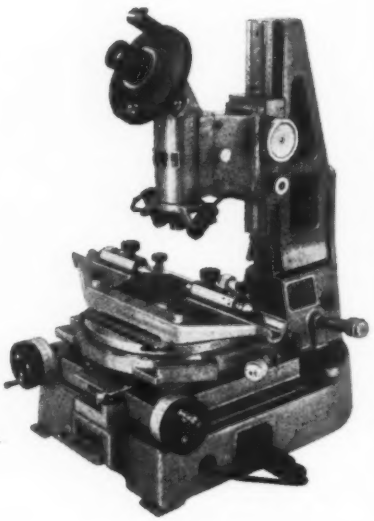
Protractor Circle
Range 360°
Reading To 1 Minute

Magnification 30X

Stage Motion
By 2 Inch
Precision Screws

Column Tilt 8°
For Helix Measurement

Rugged Construction
For Dependable
Accurate Service



ACCESSORIES

Templet Ocular Head

Standard Radius And
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THE GAERTNER SCIENTIFIC CORPORATION

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CIRCLE INFORM-A-GRAM KEY NO. 1701

The newly appointed abrasive engineer in western Massachusetts for Norton Co., is **John W. Wheeler.** He succeeds **Robert H. Langdon** who will serve as district manager for New York and northern New Jersey. In the reorganization of sales districts following the retirement of **Fred W. Elya, Ronald W. Price** was named district manager for abrasive sales in all New England states.

The Milwaukee sales territory of Lindberg Engineering Co. will be managed by **Robert Duffy.** The former district manager was **Robert Onan** who is taking over as president of the Waukee Engineering Co.

Slade B. Gamble and **Henry L. Eickelberg** have joined the sales staff of Lindberg Industrial Corp., Chicago, as application engineers for field-erected furnace installations.

Walter J. Holder will take over as central district sales manager for Houdaille-Hershey of Indiana, Inc. Prior to his promotion, he was Chicago district manager.

Firth Sterling Inc. has announced the appointment of three carbide service engineers in the firm's Birmingham, Hartford, and Los Angeles districts. They are respectively, **R. W. Guenther, D. P. Cameron,** and **Jack Glenday.**

George Dolan will manage the Pacific Coast region of Kennametal Inc. The company produces cement carbide products.

The new sales director of the Chemical Specialties Division of Pennsylvania Salt Mfg. Co. is **J. Stanley Hall. Paul C. Hurley** succeeds him as sales manager of the laundry and dry cleaning department.

John C. Mullarkey is the new technical service representative in Phoenix, Arizona, for Oakite Products, Inc., producer of industrial cleaning and metal treating materials.

Wendell E. Tessin will represent Freeland Gauge Co. in northern New Jersey. He'll handle the complete line of air gages, built-up gages, gage blocks, and accessory sets.

Denzil J. Showers will take over as sales manager of Hill Machine Co., builders of special machinery. He formerly was with Besly-Welles Corp.

The newly created post of Eastern district manager of Vascoloy-Ramet Corp. will be filled by **C. O. Burwell.**

THE PLATOCRAT -- A NEW AUTOMATIC PLATING MACHINE

A new production plating mechanism, known as the Platocrat, incorporates most of the work-saving features of expensive, custom-built automatic plating conveyors. But, because of its standardized design, many costly engineering hours are saved and the savings passed on to the buyer.

Among the Platocrat's unique features are: (1) a replaceable plating tank which enables the plater to change from cadmium to zinc in minutes, without the usual time-consuming tank cleaning operations. One tank is simply pulled aside and replaced with a spare tank. (2) The plating tank is electrically isolated from the rest of the mechanism to eliminate the possibility of stray currents. (3) Three-point rail contact of work-carriers assures constant, dependable current flow. (4) A versatile cycle allows as many as seven stations in both the pre- and post-plating cycle. Tanks are sectionalized at the factory to particular needs. (5) Racks are 12″ x 6″ x 30″; provide big parts carrying area for higher production.

. . . Continued on Next Page

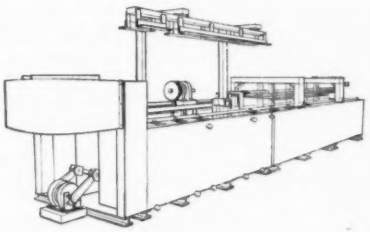

Fig. 2. Schematic view of the Platocrat.

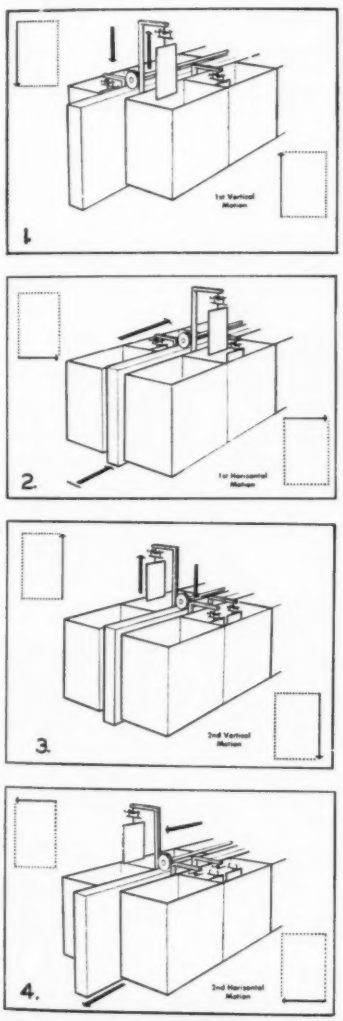

Fig. 1. Sequence of movements is shown. 1st vertical motion (1); 1st horizontal motion (2); 2nd vertical motion (3); 2nd horizontal motion (4).

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JUST a couple of passes with a handy NORBIDE Dressing Stick is all it takes to clean up a wheel face, dress a radius or groove or touch up a cup or saucer wheel. And with this conveniently sized stick you can see more of the wheel and thus avoid costly overdressing.

A NORBIDE Stick of boron carbide—the hardest material made by man—will outlast hundreds of ordinary abrasive sticks. You'll find it will greatly reduce dressing dust nuisance also.

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NORTON COMPANY, 47 New Bond Street, Worcester 6, Mass.

NORTON® BORON CARBIDE

Next to the diamond in hardness—available at a fraction of diamond cost

CIRCLE INFORM-A-GRAM KEY NO. 1711

The Platocrat, built by Wagner Brothers, Inc., Detroit, Mich., is completely hydraulically powered for smooth parts transfer. One 3-hp motor runs the entire mechanism through two hydrometers, one for horizontal motion and one for vertical movements. All transfer and conveying mechanism is mounted on a reciprocating carriage located between the two rows of tanks. This entire carriage mechanism is suspended on rollers moving in a channel track.

Two basic movements bring parts through the full plating cycle, one forward and reverse straight line horizontal motion and one raising and lowering vertical movement.

Plating racks are attached to work-carriers at the loading station. When the machine is started, lifting arms fixed to the carriage engage the work-carriers being transferred and lift them at all points on one side of the machine, carry them forward to the next station where they are lowered and disengaged from the lifting arm. This sequence is simultaneously produced in reverse on the opposite side so that, when the lifting arms are lowered on one side, they are raised on the other side. In the end tank, the work-carrier is advanced by means of a reciprocating arcuate rail actuated with the carriage movement.

Lubrication is centralized, quickly accomplished with an effortless push of a button. The machine requires a minimum of head-room (only 9') since there is no overhead superstructure.

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WET
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These outstanding features are exclusive with the Hammond 6" Wet Carbide Grinder:

- You're "Dry" when you grind "Wet". No Spray — No Splash guards, pans and spouts keep operator and floor dry.
- Safety Cup Disc fills cup of a silicon wheel which prevents hand injuries and dropping tool into the cup of the wheel.
- Screw Feed Tables make table adjustment easy and protect against wheel damage.

For those who prefer to grind dry, the Model D-6 Dry is available. The trend, however, is to the Wet Model WD-6 with which the dust problem is eliminated and the advantages of wet grinding enjoyed —and at the nominal price of $395, complete as shown less wheels.

Write for catalog showing America's most complete line of carbide tool grinders.

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CIRCLE INFORM-A-GRAM KEY NO. 1721

Short Stroke Broach Increases Metal Removal

Production broaching for metal removal can net a return of anywhere from 5:1 to 20:1 over a good many machining operations. It also can shift a slow job into high-gear production, reducing some fringe production necessities such as inspection, testing, and other quality control methods.

Experience has shown that intricacy of the part to be broached is not a deterrent in applying a broach on a job. If there is clearance for a broach to make its pass, it is reasonable to expect that advantage can be taken of all the production economies offered by this method of metal removal.

An example of broaching technique developed by Acar Broach Co., 25300 Groesbeck Highway, East Detroit, Michigan, was finishing an overrunning clutch for one of the large automotive makers. The problem was to produce internal finishes of around 20 to 30 micro-inches. Formerly 60 micro-inches was the best that could be attained, and the auto company was seeking a different method of grinding than the one being used.

The application of a short finishing broach on the job not only produced finishes better than called for by the specifications, but also increased production time several hundred percent.

Honing time was reduced to a bare minimum, being used merely to clean off the blackening caused by heat treating.

In the plant of another large auto builder, use of a dual-ram broaching machine to produce a

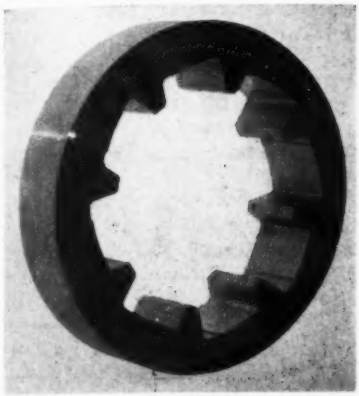


Fig. 1. Over-riding clutch part—broaching starts with blank with pierced center to produce this part with finishes of 20 to 30 micro-inches.

part for a steering wheel mechanism jumped production from 60 to 300 pcs/hr.

Formerly the job tied up two millers, two drill presses, and required the use of special fixtures to do the work successfully.

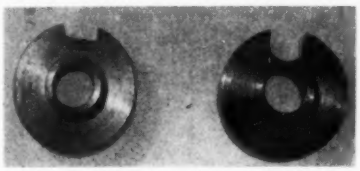


Fig. 2. Two broaching operations on short stroke machine produce above steering wheel part in two stages—first roughing, left, and finishing.

In this instance, two roughing broaches were used on one ram and two finishing cutters on the other, the machine producing two pieces per cycle. This was done to make use of an existing short stroke machine.

Outstanding advantage in both of the above cases was that once the work was locked in the broaching machines, inspection was practically eliminated. It was no longer necessary to inspect each part, a spot check was all that was needed.

BUY U. S. SAVINGS BONDS

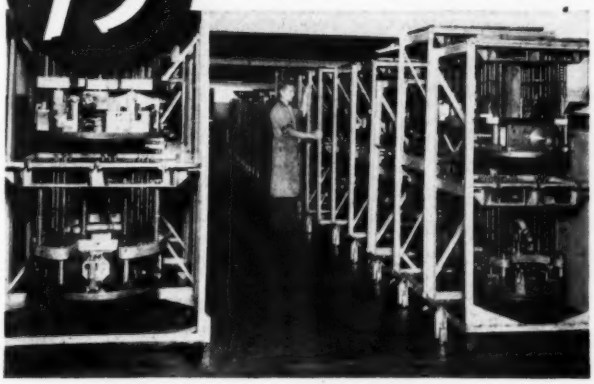
1955 Gage Blanks Supplement Now Available

Copies of the 1955 Supplement to "Commercial Standard CS8-51 Gage Blanks" are now available according to an announcement by the U. S. Department of Commerce. This publication was developed by the American Gage Design Committee to be used with the 1951 Commercial Standard Edition, which deals with dimensions of gage blanks, frames, and fittings.

Providing data on gage blanks, the 1955 Supplement covers added sizes and handles for wire type gages, both plain and thread. The use of stocks of uniform components facilitates gage production.

Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D.C. The Supplement is ten cents per copy and the CS8-51 Commercial Standard, thirty-five cents.

75 SEIBERT-EQUIPPED Machine Heads at WOODWARD GOVERNOR COMPANY



Simplify Tooling Changeovers . . . Help Build Precision Parts Faster

At Woodward Governor Co., Rockford, Ill., an ingenious method of machine head storage reduces setup time and minimizes damage to spindles and tools. The main illustration above shows how 75 interchangeable heads, equipped with more than 1500 Seibert precision-built spindles, are neatly arranged and numbered to permit fast and easy removal in and out of storage to machine location. Woodward Governor, another company whose production requires precision tolerances and high quality, has been using Seibert tools for more than 5 years.

3 Reasons Why Users Specify SEIBERT

Investigate the 3 reasons why users specify Seibert tools. You will find they meet exacting tolerance requirements . . . you save money for Seibert tools are lot produced in a wide range of standard sizes . . . and your orders receive prompt handling because Seibert specializes in production tools only.

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CIRCLE INFORM-A-GRAM KEY NO. 1731

APPLICATIONS OF THREAD AND FORM ROLLING

by C. T. Appleton
Vice President
REED ROLLED THREAD DIE CO.
Holden, Massachusetts

THE THREAD-ROLLING PROCESS is now recognized as a preferred method of producing threads of uniform quality and is more widely used today than at any time in its history. It has already proved to be very beneficial in meeting the demands of the metalworking industry for better quality threads.

Thread rolling is a simple cold-forging process confined almost entirely to external threads. Hardened steel dies are used to roll the threads. The working faces of the dies have a thread form which is the reverse of the thread to be produced. The dies are pressed against the periphery of a plain cylindrical blank and reform the surface of the blank into threads as the blank rolls on the die faces. In penetrating the surface of the blank, the dies displace the material to form the roots of the thread and force the displaced material radially outward to form the crests of the thread. The blank has a diameter part way between the major and minor diameter of the thread.

Unlike other threading processes, no material is removed and consequently no chips are produced. Rolled threads have increased strength, greater accuracy and a high degree of surface finish. They are uniformly produced at high rates of production with no wasting of material.

from its big ball-bearing spindle . . . .
. . . . to the precision carriage . . . .
along its rugged, accurate bed . . . .
to the tailstock . .
. . . . and down to the variable speed drive . . .
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CIRCLE INFORM-A-GRAM KEY NO. 1741

Increased Strength

The cold forging that threads receive during the rolling process strengthens them in tension, shear, and fatigue. When a thread is rolled, the fibers of the material are not severed as they are in other methods of thread production, but are reformed in continuous unbroken lines following the contours of the threads.

Rolling between smooth dies leaves the thread with smooth burnished roots and flanks, free from tears, chatter or cutter marks that can serve as focal points of stress and, therefore, starting points for fatigue failures. Rolling also leaves the surface layers of the thread, particularly those in the roots, stressed in compression. These compressive stresses must be overcome before the tensile stresses can be built up which, alone, can cause fatigue failures.

Improved fatigue strength is reported to be on the order of 50-75%. On heat-treated bolts from 36-40 Rockwell C hardness, that have the threads rolled after heat-treatment, tests show increased fatigue strength of 5 to 10 times that of cut threads.

Material Savings

Where blanks are prepared by heading, extruding or stamping, or where the thread is the larg-

Adapted from paper presented before the recent semi-annual meeting of The American Society of Mechanical Engineers, and reprinted here through courtesy of the ASME.

est diameter on the part, as in the case of a stud, rolling will save material. This results in savings ranging from about 16% on larger diameter threads to over 27% on smaller diameter threads. On stampings, the thickness of metal from which the stamping is made can often be reduced. This also reduces the weight of the scrap strip or sheet from which a stamping is made.

Accuracy and Uniformity

The production of accurate threads normally requires that close control be exercised over pitch diameter, thread angle, lead, taper, roundness and drunkenness. The tolerances specified for pitch diameter include all errors of pitch diameter, lead, thread angle, and taper.

The thread angle produced on the work is dependent upon the accuracy of the thread-rolling dies, while the accuracy of the lead produced is dependent upon the accuracy of the dies and the material being rolled. In most cases, the lead of the thread on the die is exactly reproduced on the material rolled.

There are a number of reasons why it is inherently easier to achieve accuracy on pitch diameter, thread angle, lead and taper by rolling than by other processes and, what is often equally important, to maintain that accuracy over long periods.

The thread form of a set of thread-rolling dies is faithfully reproduced on the parts, and does not change appreciably during the entire life of the dies. Thread-rolling dies do not wear out in the same manner as do other threading tools. Wear, instead of being concentrated on a sharp cutting edge, is distributed over a broad surface, and the rolling action is relatively free from friction. Therefore, the thread form of a rolling die is not changed by erosion, nor does it fail to reproduce itself because of dullness or adhesion. It cannot be altered by improper sharpening, as sharpening is never required.

Smooth Finish

In cold-forming operations the surface finish left on the work is a close approximation of the surface finish of the dies. This holds true in the case of thread rolling except that the threads produced are ordinarily smoother than the dies or rolls. This improvement is accounted for by the slight slipping and burnishing that the thread always receives as it rolls against the dies.

Speed and Economy

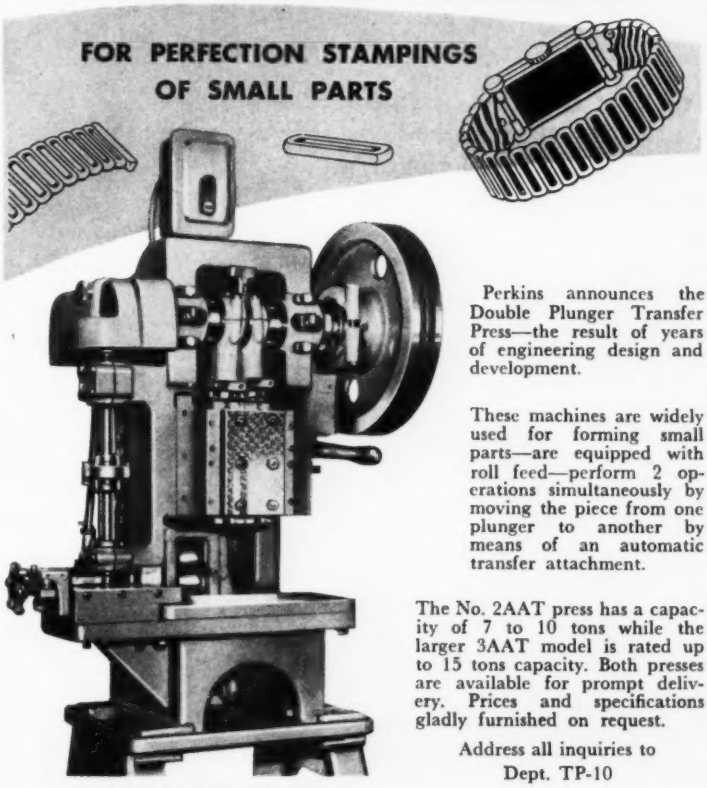
Rolling has long been conceded to be the fastest method of producing threads. Although it is generally appreciated that thread rolling has proved economical on large quantity production, similar savings and economies are realized on small lot production.

Threads may be rolled on automatic screw machines without reducing spindle speeds, and the fact that rolling can be done on the collet end of the part behind a shoulder often saves a secondary threading operation.

As thread-rolling dies do not require sharpening, downtime is reduced and sharpening and resetting labor is saved. Also, the uniformity of the threads pro-

PERKINS 2AAT and 3AAT TRANSFER PRESSES

FOR PERFECTION STAMPINGS OF SMALL PARTS



New 2AAT Transfer Press

Perkins announces the Double Plunger Transfer Press—the result of years of engineering design and development.

These machines are widely used for forming small parts—are equipped with roll feed—perform 2 operations simultaneously by moving the piece from one plunger to another by means of an automatic transfer attachment.

The No. 2AAT press has a capacity of 7 to 10 tons while the larger 3AAT model is rated up to 15 tons capacity. Both presses are available for prompt delivery. Prices and specifications gladly furnished on request.

Address all inquiries to Dept. TP-10

PRESSES BUILT TO SPECIAL SPECIFICATIONS

Perkins Power Presses SINCE 1885

PERKINS MACHINE CO.
WARREN, MASSACHUSETTS

CIRCLE INFORM-A-GRAM KEY NO. 1751

duced by thread rolling eliminates costly inspection.

Versatility of Application

Thread rolling is a versatile process capable of forming a wide variety of threads on many different materials, and, in addition, capable of performing several nonthreading operations such as rolling of oil grooves and annular rings, burnishing, knurling, forming splines and serrations, and crimping. Threads can be rolled easily on metal stampings due to the ductility of the material used in the stampings.

Worms with rolled threads provide quieter worm drives with longer life. The superior burnished finish on the rolled thread increases the life of the mating gears where nonmetallic gears are used.

The aircraft industry prefers thread rolling and uses it to produce smooth, accurate threads on aircraft parts for both jet and piston engines.

BURR-MASTER

For Every Gear Deburring Job

You can't afford obsolete methods when Burr-Masters can "deburr and chamfer" gears and splines up to 300 teeth per minute!

Universal machines for internal gear and spline deburring. Data in Bulletin 103-81.

Hypoid pinion deburring machines are available in single or multiple station models. Data in Bulletin 103-100.

Eight Universal models, single or two station, deburr and chamfer spur or helical gears and external splines. Get complete data in Bulletin 103-60.

MODERN Industrial Engineering Co.

14230 BIRWOOD AVE. DETROIT 38, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1761

Preferred Forms for Rolling

Whenever a material is penetrated by a thread-rolling die, a volume of the material is permanently reformed. A die having a relatively sharp crest easily penetrates a blank. The particles of materials that are pressed down by a narrow crest flow easily away from that edge and along the surfaces of the flanks of the thread form. Particles a short distance away from the thread surface of the die have little or no distortion. Therefore, when rolling threads or other forms with wide root flats, it is desirable, where possible, either to round the edges of the root flat with as generous a radius as possible, or design the thread with a full-radius root. These rounded surfaces on the crests of the threads on the die streamline the flow of the material and provide an easier entering action of the dies into the blank.

American Standard and similar thread forms with narrow root flats roll easily. Threads for lag screws, wood screws and tapping screws have wide root flats and are usually rolled with flat dies specially designed to start the penetration with a narrow flat, and then gradually enlarge the width of flat to size.

Blank Design and Specifications

Blank diameters are prepared in a number of ways. For common fasteners, such as bolts, cap screws and machine screws, the blanks are usually cold-forged in heading machines. Close blank tolerances are maintained with carbide heading dies. Many parts are prepared for rolling on screw machines with the use of shaving tools. For very accurate threads with high hardness, the blanks are usually centerless ground.

The design of blanks varies for different kinds of work. The ends of the blanks should be beveled to prevent excessive chipping of the threads on the dies or rolls. The angle and depth of bevel are important. A bevel of 30° from the axis of the blank, which gives 60° included angle, is preferred for general conditions. The diameter at the small end of the bevel should be less than the minor diameter of the thread.

In general, blank diameters should be less than the maximum pitch diameter of the thread and blank-diameter tolerances should be as small as practical for economical manufacture. On shorter thread lengths, especially with very soft materials, there is some endwise stretching of the blank. To offset this and obtain sufficient radial displacement of the material, it is necessary to increase the blank diameter to compensate for the endwise stretching.

Since rolling does not remove or compress material, it is necessary that the blank does not contain more than the correct amount of material to form the finished thread. Also, the dies must be set up so they will roll maximum major and pitch diameters when using a maximum diameter blank. Otherwise, the blank will be over-rolled and the dies will become overloaded.

Variation in the diameter of the blank results in variation in the major diameter of the thread when the dies are set in a fixed position. Blank diameter tolerances must therefore be controlled according to the accuracy of the thread to be produced.

DIES AND ROLLS

The general specifications of the dies and thread rolls are dependent upon the equipment and attachments selected for the job. The particular design of the dies and rolls, however, is determined according to the method of processing and the specific details of the work.

Under ordinary conditions each thread diameter and pitch requires a set of dies made especially for the diameter and pitch specified. The same dies are not recommended for different diameters of the same pitch.

It is well to remember that even though the threads to be rolled do not necessarily have to be held to close limits, precision-made dies are always more economical to use. Accurate dies can be set up more quickly and more precisely, with the result that not only is downtime reduced, but the life of the dies is increased.

The width of face on a die or thread roll is very important. The proper face width and the correct bevels on the dies not only prevent chipping of the end threads or breakage in the dies, but determine the number of settings possible for rolling on the face of the die. The width of the die face for in-feed rolling must always be greater than the length of thread to be rolled.

EQUIPMENT AND APPLICATIONS

Most of the threads produced today are rolled on thread-rolling machines and automatic screw machines. The thread-rolling machines use flat and cylindrical dies, while the automatic screw machines use cylindrical thread rolls. In most instances, the entire length of thread is formed by the in-feed method. Through-feeding is used on cylindrical die machines for continuous threading of long bars and short headless parts. End-feeding thread-rolling attachments are also used for through-feeding of longer threads.

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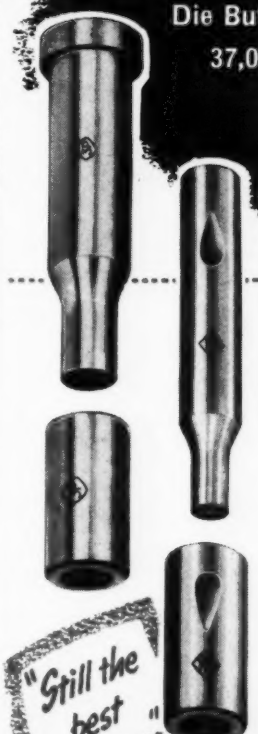
IMMEDIATE DELIVERY of 3-P Punches and Die Buttons is made possible because over 37,000 Standard sizes are in STOCK. In fact, Porter Precision Products are stocked in all principal cities.



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CIRCLE INFORM-A-GRAM KEY NO. 1771

Reciprocating (Flat Die) Machines

Flat dies are used in reciprocating types of thread rollers, including boltmaker machines. The machines are made in a number of sizes, each for a limited diameter range and with a specified length of die. Two dies are used; one stationary and one moving — and the rolling faces of the dies are located opposite each other. A thread is rolled on one blank at a time during the forward stroke of the machine. There is no axial movement of the blank during rolling. The diameter of the finished thread is controlled by the diameter of the blank and the distance between the faces of the dies at the finish end of the stroke.

The number of revolutions provided for rolling a thread on a blank is dependent upon the die length, and the rate of penetration is determined by the shape of the die. The largest size of threads rolled on common types of reciprocating machines is approximately 1".

Rotary Planetary Machines

These recently developed machines have one central rotary die on a fixed axis and one or more stationary concave segment dies located to the outside of the rotary die. The starting end of the segment die is set so the segment and rotary dies will just contact the blank. The finishing end of the segment die is set closer to the axis of the rotary die so the thread is fully formed when the blank rolls past the finish end of the segment die. One or several blanks may be rolled in a segment die at one time dependent upon the setup. There is no axial movement of the blank during rolling.

These machines are made in several small sizes, with limited diameter ranges. Each size machine has a specified length of segment die and the number of revolutions provided for rolling a thread on a blank is dependent upon the segment die length. Speeds may be varied to accommodate the rolling of different kinds and hardnesses of materials.

Cylindrical Die Machines

Cylindrical die machines have a wide range of speeds and feeds, and are widely used for in-feed rolling with no axial movement of the blank during rolling. Since the dies are circular in shape, there are no limitations on the number of revolutions provided for the rolling of a thread or the rate at which the dies feed into the work. Cylindrical die machines are made with two or three dies and the three-die machines have diameter capacities exceeding 4".

Two-cylindrical-die machines have two opposed dies mounted on parallel axes and the blank to be rolled is supported on a work rest between the dies. The dies rotate in the same direction. The axis of one die is stationary and the axis of the other die moves toward the axis of the stationary die to roll the thread on the blank. The moving die then recedes to release the threaded blank. The diameter of the finished thread is controlled by the size of the blank, the distance between the dies, and the posi-

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Buy ARMSTRONG TOOL HOLDERS and TOOLS for today's job and they will bring you added profits thru the years. With ARMSTRONG TOOL HOLDERS you will be permanently tooled up for whatever comes, for each is a multi-purpose tool that takes cutter-bits ground to many shapes. Each is an efficient tool, refined thru a half century of world wide use. Each has strength beyond any need, extra strength resulting from endless research and the most modern closely controlled manufacturing methods.
ARMSTRONG TOOL HOLDERS are inexpensive too, for they are produced in great numbers. They are instantly available because they are carried in stock by all leading supply houses in sizes and types for every operation on lathes, planers, slotters and shapers; for standard operations on turret lathes and screw machines. They are profitable in use because they permit the highest speeds and heaviest feeds, and "Save: All Forging, 70% Grinding and 90% High Speed Steel."
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CIRCLE INFORM-A-GRAM KEY NO. 1781

tion of the center of the blank in relation to the centers of the dies. The center of the blank raises from the stationary work rest as the diameter of the blank increases during rolling.

Three-cylindrical-die machines have three dies equally spaced around the blank which floats between them. The dies are mounted on parallel axes and rotate in the same direction. All of the dies move toward the center of the blank to roll the threads and then recede to release the threaded blank. The diameter of the finished thread is controlled by the size of the blank and the distance between the three dies.

Both types of cylindrical die machines can be adapted to feed blanks axially which is known as through-feed rolling. However, the three-die machines can feed either hollow or solid blanks through the dies.

THREAD ROLLING ON SCREW MACHINES

Rolling threads on screw machines and automatic lathes is most commonly done with attachments using one or two thread rolls.

When rolling with one thread roll, the pressure is usually directly against the spindle and the blank. With two opposed rolls that form the thread between the rolls as they straddle the blank, the direct pressure on the spindle and blank is reduced to approximately 15% of the pressure exerted by one roll. Consequently, there is less spring of the blank and reduced wear on the spindle bearings when using two rolls.

With a single roll feeding directly toward the center of the blank, the size of the finished thread is controlled by the size of the blank and the final positioning of the cross slide which determines the center distance between the roll and the blank at the time of completing the thread.

Attachments with two rolls usually have two opposed thread rolls which form the thread between the rolls as they straddle the blank — final size of the thread being obtained when the rolls are on the center of the work. The size of the finished thread is controlled by the size of the blank and the fixed setting of the rolls in the attachment. The cross-slide travel is only used as a means of supplying movement to the rolls.

In applying a thread-rolling attachment to a screw machine it is first necessary to decide on the cross-slide position for rolling, and in most cases the work and tooling arrangement determine this. However, the positions which are generally preferred for thread rolling are recommended by manufacturers of the automatic screw machines and thread-rolling attachments.

An attachment also must fit within the confines of a tooling sector of an automatic. Sufficient cross-slide travel is required to withdraw the rolls from the center of the work to a position where the work will clear the outside of the rolls when it indexes from one station to the other.

In considering the work revolutions and feeds, it is first nec-

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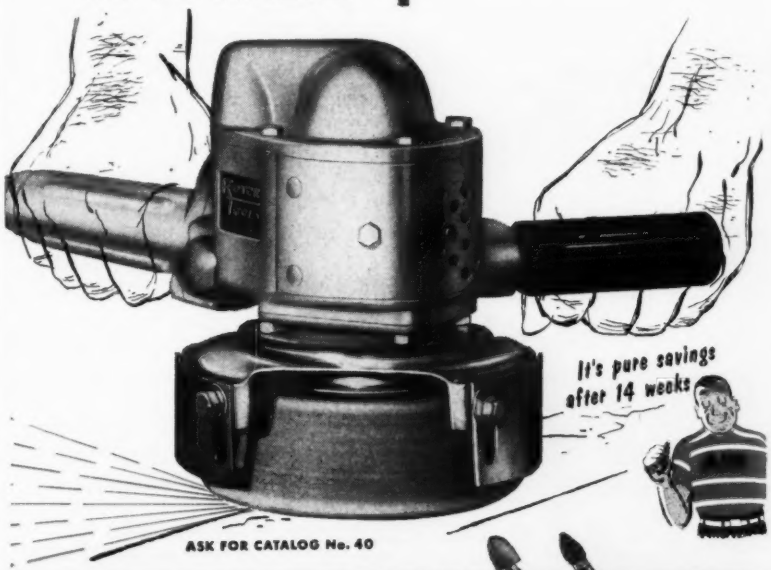

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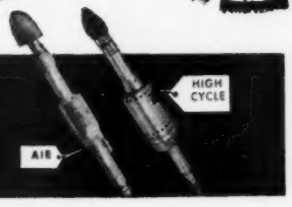

CIRCLE INFORM-A-GRAM KEY NO. 1791

essary to determine the amount the thread rolls advance to complete the rolling after they first contact the work. This advance is the amount of cross-slide travel used in rolling the thread, and the rate of feed applied during the advance determines the number of work revolutions used in rolling the thread.

Threads should be rolled with as few revolutions as possible. The spindle speeds are ordinarily the same as those for other operations. Upon reaching full thread depth, the thread rolls should be immediately withdrawn from the work. Suggested work revolutions for various materials and TPI and also the theoretical amounts of advance for different thread sizes are recommended by manufacturers of thread rolling attachments and screw machines.

The correct design and selection of cam is important for the proper operation of an attachment. The ideal movement of the attachment during one revolution of the cam is to move the center of the rolls to the centerline of the work at a predetermined feed per revolution, zero dwell at the centerline of the work, and instant rapid return. It is well to mention the importance of synchronizing the high point of the cam with the fast-feed cycle of the machine during setup of the machine for rolling.

An accumulation of work revolutions caused by a slow return of the attachment will result from a retarded setting of the cross-slide feed cam in relation to the fast-speed cycle of the machine. Slow return of the attachment, due to the retarded setting, will cause desirable slide pressure on the roll-tooth form and possible chipping of the rolls.

An increased penetration rate, caused by a fast feed of the attachment during the final revolutions of the rolling cycle, will result from an advanced setting of the cross-slide feed cam in relation to the fast-speed cycle of the machine. An increased penetration rate due to the advanced setting will cause the rolls to plunge forward suddenly, exerting additional load on the attachment.

RATES OF PRODUCTION

Production rates vary with the nature of the work, hardness and kind of material and the equipment used. The rate of production is usually less for harder materials and where the work is difficult and slow to handle. Since threads are normally rolled on automatic screw machines without reducing spindle speeds, the rate of production obtained is usually determined by other factors that control the time cycle of the machine.

To secure the most satisfactory rolling conditions and die life, it is important that the proper type and size of equipment be used. Rugged equipment with ample power is required to roll threads on heat-treated parts.

The best rolling conditions and maximum die life can only be obtained when correct die speeds and number of blank revolutions are used for rolling the thread. This is particularly true when close accuracy for roundness and size is required, especially on harder materials. Too many

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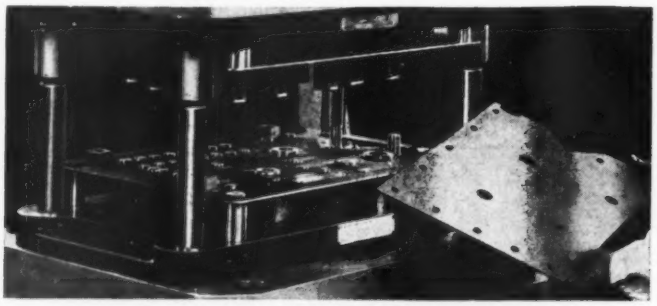

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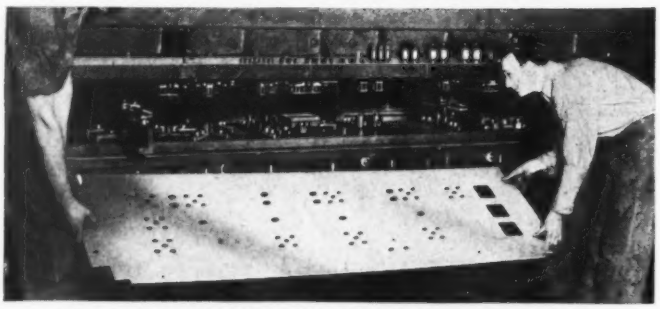

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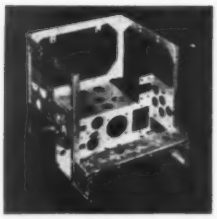

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revolutions of the blank may have a tendency to work-harden some types of materials, and thereby reduce the life of the dies.

The shape of the rolling face of a flat die determines the amount of die penetration for each revolution of the blank. The penetration rate is usually much greater at the beginning of the rolling stroke than at the end.

When using cylindrical dies or thread rolls, the rate of penetration is controlled by the amount of feed applied to the dies for each revolution of the blank. The die penetration per revolution of the blank varies with different equipment, kinds of work and types and hardnesses of materials rolled. Lower penetration rates apply to the harder materials, hollow parts or non-rigid parts.

Diameters from 0.060" to over 4" can be readily rolled on existing equipment, and special equipment for both larger and smaller threads can be developed when required. Threads per inch ranging from 2 to 80 are being rolled, and dies for both finer and coarser threads can be produced.

The Inform-A-Gram card page 156A is for your convenience in obtaining additional information about editorial subjects and advertisers' products.

28 Points in Industrial Truck Safe-Driving Program

Major rules governing the safe and effective use of powered industrial trucks were cited by W. A. Meddick, vice president of The Elwell-Parker Electric Company, Cleveland, in a special report to industry issued recently.

According to Meddick, "Some companies find that the introduction of industrial trucks skyrockets accidents and damages to a point where economies normally expected from such equipment are not realized.

"However, since the human elements affect truck operation so closely, proper selection and efficient training of truck operators are the keys to obtaining maximum truck potential. It doesn't matter if you use one or one thousand industrial trucks; driver training is a must. After all, one truck in a small plant can do just as much damage, and often more in proportion, than a fleet of trucks in a larger plant."

As a positive aid to both large and small companies in the maintenance of an effective driver safety program the following 28 points were cited:

1. Drivers must be able to stop within 8′ in open aisles or roadways; within 3′ in narrow aisles, near machinery, and in congested areas. A distance of at least 10′ must be maintained between moving vehicles. Extreme care must be exercised where floors are wet or greasy.

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2. Trucks must be completely stopped and the horn sound before: (a) entering doors of all buildings, (b) approaching blind corners, (c) turning into or crossing main aisles, (d) entering ramps.

3. Vehicles must be started and stopped without skidding the wheels.

4. Drivers must learn the capacity of their vehicles and lift no loads above that capacity.

5. Disabled trucks must be towed by another vehicle; they must not be pushed.

6. Don't allow loads to obstruct the operator's view. Normally, loads should be such that this does not happen. If in extreme cases such size loads are unavoidable, the truck should be moved backwards.

7. Loads should never be picked up with forks off center. A probable result: spilled loads, damage to truck or surrounding areas, injury to operators or other workers. If a load is set down temporarily, the same care in picking it up again should be exercised. By the same token, loads should be prepared so that the weight of a load unit itself is not appreciably off center. Loose loads should be carried in proper containers.

8. Personnel other than the driver himself should never operate or ride on an industrial truck. Unauthorized persons riding on forks or platforms, sitting on the battery or engine compartment, crowding the operator, or hanging onto the truck can only invite compensation claims. Practical jokes can lead to serious injuries. Also, except under extreme cases or when closely supervised, a fork or platform truck should never be used to hoist personnel to reach the top of piles or other inaccessable areas.

9. Travel areas for industrial trucks should be kept free of ruts, obstacles, grease, oil, pits, etc. Failure to do so increases accidents. Truck operators should look out for such unsafe operating conditions and report them immediately.

10. Loads should be carried as low as possible. The higher the load is carried the more difficult it is to control. Loads carried high obstruct the operator's view, hinder maneuverability and reduce truck stability.

11. Doorways, corners and other travelways should be outlined with bright colors or hash marks. Pipes, machinery and other obstructions should be outlined in contrasting colors so that drivers can spot them immediately. Also, trucks should be painted in bright colors so they may be seen by other personnel. If a driver is not sure he has sufficient clearance, he should stop his truck and make sure—not guess.

12. At the first sign that a truck is not operating 100% efficiently the driver should report it to the maintenance department or to authorized personnel. Equipment failure caught in time can prevent many accidents.

13. Drivers should avoid making sudden or jerky stops. The momentum of the load may play tricks on the operator. Special

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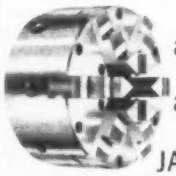

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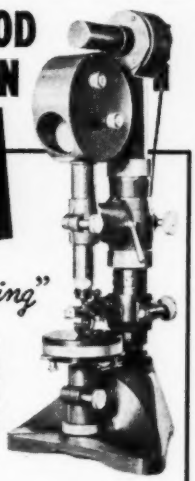

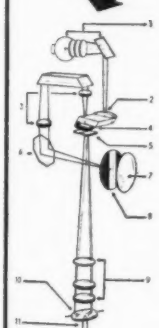

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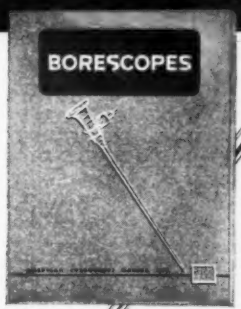

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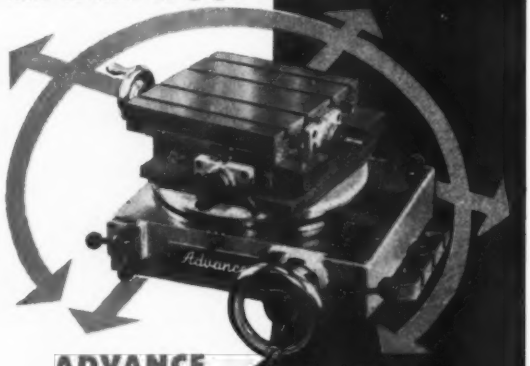

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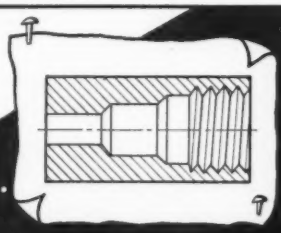

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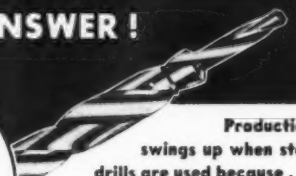

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care should be taken in stopping when a load is elevated for tiering or stacking.

14. If the truck has a tilting device it should be used. By tilting the uprights toward the operator, the weight of the load is brought back slightly and balance is improved. This slight tilt of 8-10° helps avoid spilling the load when rounding corners and making quick stops.

15. Railroad tracks should always be crossed diagonally instead of at right angles.

16. The truck should be kept clean at all times. Dirt and rubbish make footing uncertain. It may cause trouble if obstructions lodge in the mechanism.

17. Traffic rules should always be observed. Operators should keep to the right and not travel in the wrong direction in one-way lanes. They should watch for low clearances.

18. Trucks should not be driven with wet or greasy hands. If necessary, a towel or wiping rag should be kept where it can be easily reached to dry hands before taking hold of the controls.

19. Operators should slow down before opening doors by remote control. They should be prepared to stop safely if it is found that the automatic mechanism is out of order or if the way is not clear beyond the door.

20. Fire prevention rules should always be observed. If the truck carries a fire extinguisher it should be in good condition and the driver trained in its use.

21. Swinging doors should be approached squarely and in the center to avoid breaking hinges.

22. The horn should be used, but not abused. The driver must signal when approaching intersecting aisles, blind corners, or swinging doors. Several short blasts are better than one long blast. A driver should signal and slow down when approaching a pedestrian who is walking away from him. However, startling others with loud blasts of the horn should be avoided; the horn can be a hazard if used improperly. Sounding of the horn does not give the driver the right of way.

23. Trucks should be parked safely. They should not be left where they will block aisles, loading platforms, or doorways.

24. Operators should look before they start and be certain that personnel and objects do not obstruct the path of the truck, not only at leg level but also at head level. Particular care must be taken before backing out from a load.

25. Every collision should be reported to authorized personnel. Even if no damage is done, the causes of all collisions with other trucks, with persons, or with other objects, should be determined and corrected.

26. Crowds should be avoided. This should include congested areas during shift changes and lunch periods.

27. If more than one truck is operating in the same area, the one following must stay at least 15′ behind. Trucks should never travel two abreast.

28. Hoists should be handled carefully. They should not be raised or lowered when traveling. Hands should be kept off hoist tracks.

BRYANT B-21
THREAD GAGE
checks internal and external
threads 8 to 10 times faster!
Car door handles—Checking internal groove diameter and the relation of groove to a face.
Shell Noses—Checking internal thread and concentricity of a bore to the thread.
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You can speed up quality control and reduce inspection costs with the Bryant B-21 Bench Gage. Partially turning the work inspects the thread—with utmost accuracy—with visual indication of assemble-ability!
This Bryant gage checks threads in all tolerance classes and in sizes ranging from 5/16" to 5" diameter for internal threads and 1/8 to 5" diameter for external threads.
The gaging contacts are a pair of threaded segments, which are interchangeable to cover a wide range of diameters. Both "Go Form" and "Pitch Diameter" segments are available. These segments have a much longer life than conventional plugs and rings. Attachments for checking squareness-of-face and concentricity in relation to the axis of a thread are also available.
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JETTISONABLE FUEL TANKS BUILT ON FOUR-MINUTE CYCLE

A new plant designed for maximum production with minimum effort has recently been put in operation by Pastushin Aviation of Los Angeles.

By utilizing semi-automatic special tooling, handling equipment, and gaging and machine controls, the plant is geared to produce a jettisonable fuel tank every four minutes.

In full operation, the assembly line uses just under 10 tons of aluminum alloy during an 8-hr shift, with approximately 53 employees, in a work area of 50′ x 100′. Detail fabrication of bulkheads, intercostals, and other sheet metal, cast, and forged parts, are accomplished outside this area and stockpiled in store rooms adjacent to the assembly line. In planning production, it was determined that a four-minute production cycle was necessary to produce the volume required in the event of a national emergency.

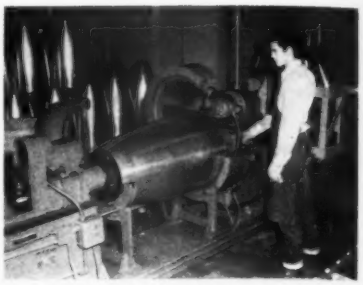

Fig. 1. Forward skin trim machine. Locates and trims both ends of forward section to diameter and length and drills drain hole. Controlled and powered electrically and pneumatically. Operator loads and unloads only—requires no skill.

In the first production operation, sections are rolled into conical or cylindrical shapes, and are conveyed to the line welder which welds the longitudinal seam. The weld is rolled flat to produce uniform thickness. The center section then goes to a subassembly area where bulkheads and internal structures are installed; tail and nose sections go to bulge forming machines where forming progresses in three operations.

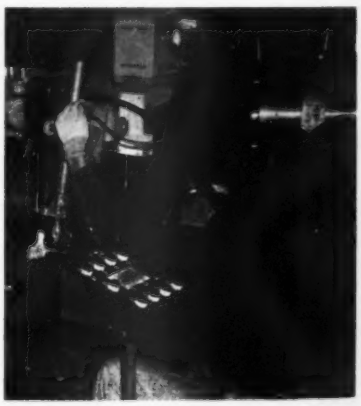

Fig. 2. Aft cap to aft skin heliarc welder. Welding aft cap to aft skin. All operations including welding feeds are controlled electrically or pneumatically to insure maximum strength to weld area and neat appearing welds. Replaces approximately six hand welders.

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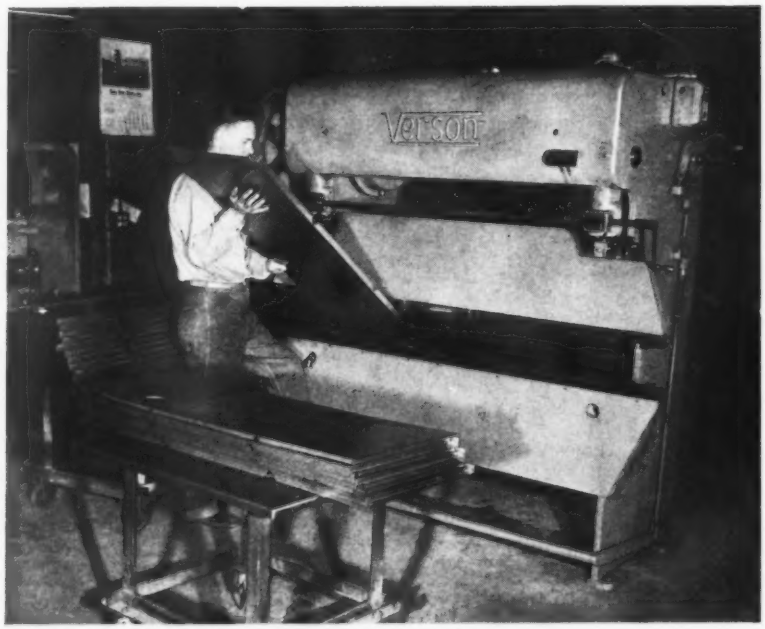

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Fig. 3. Assembly rack and drilling machine. Bulkheads and upper intercostal are assembled on rolling fixtures and four holes accurately drilled at one time to mate with support casting. Eliminates any possible guess work on alignment and insures accuracy.

Nose and tail skins are trimmed on special machines which produce a true surface for subsequent joining of other sections. At this point, sheet metal spinnings for nose and tail cones come to the line where they are joined to the nose and aft sections by automatic heliarc welding machines.

The critical operation that determines the four-minute assembly cycle comes when two special welding machines join center and aft sections. Final operation consists of a pressure check, after which tanks are crated on another conveyor line and are carried away, 27 tanks to a truck.

Fig. 4. Forward skin bulge form machine. Showing skin being formed. Sixteen segments expand to give the desired shape and are powered by hydraulics capable of pulling 450 tons. Skins are formed in two minutes floor to floor saving untold time and labor compared to other methods.

Heavy Duty Lathe Converted for Horizontal Boring

Boring time for large SAE 1045 cast steel drill hook housings was more than halved in a recent operation at the Byron Jackson Co. in Los Angeles, Calif., where a 10-year-old Axelson heavy duty lathe, Figure 1, was converted to use simultaneously three cutter heads—each equipped with four single point tools.

The Byron Jackson Co., manufacturer of oil tool drilling equipment, had been performing the operation — until the conversion — by boring and counterboring three separate diameters in each housing on a conventional horizontal boring mill.

Machining problems created by the castings, which vary in size from 15″ to 23″ in diameter

. . . *Continued to page 222*

to economize
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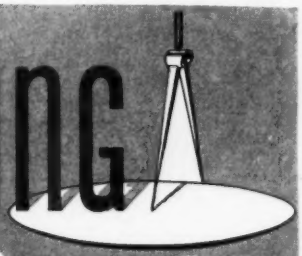

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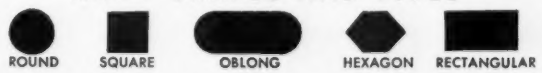

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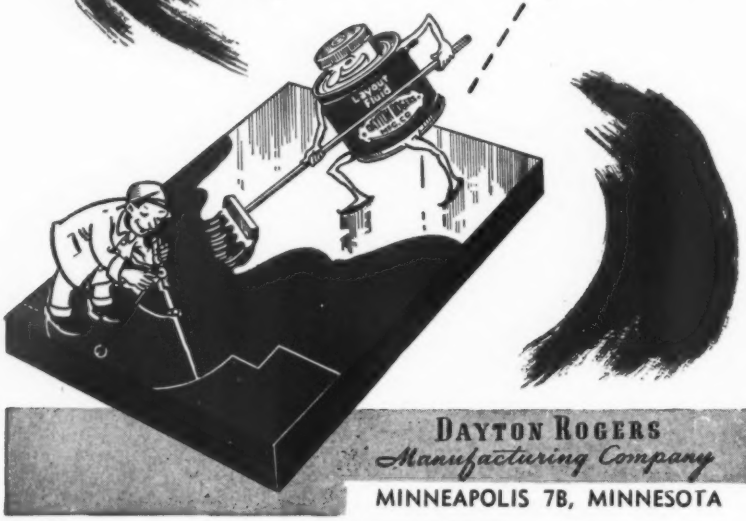

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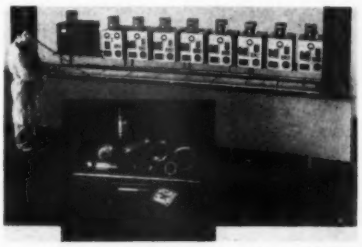
The advantages of hard chrome plating for increasing tool and gage life, and for salvaging worn and undersized parts are well known. However, it is not so well known that hard chrome can be deposited within precision tolerances without subsequent grinding, lapping, or other mechanical operations.

Plating equipment, built by Chrome Electro-Forming Co., 7515 Lyndon Avenue, Detroit 21, using the Morey Process can plate in grooves, recesses, and shoulders, and at the same time maintain sharp, clean corners, necessary for thread gages, taps, and drills. The chrome can be deposited at the rate of .000001" per minute and held to a tolerance of .0001" with no grinding or lapping of the workpiece to size.



The plate will not chip, flake, or spall and will withstand such shock as is encountered on chisels and riveting bucks without checking. The plate is extremely dense and close grained, giving not only better resistance, but superior resistance to erosion and corrosion.

Finish and form parts are duplicated exactly after plating and there is no need to roughen or etch to provide the bond.

The secret of the Morey Process is the close control over time, current density, and solution temperature which guarantees satisfactory and uniform performance of the units.

Descriptive literature and further information is available from Chrome Electro-Forming Co., 7151 Lyndon Avenue., Detroit 21, Michigan, or **Circle D-1.**

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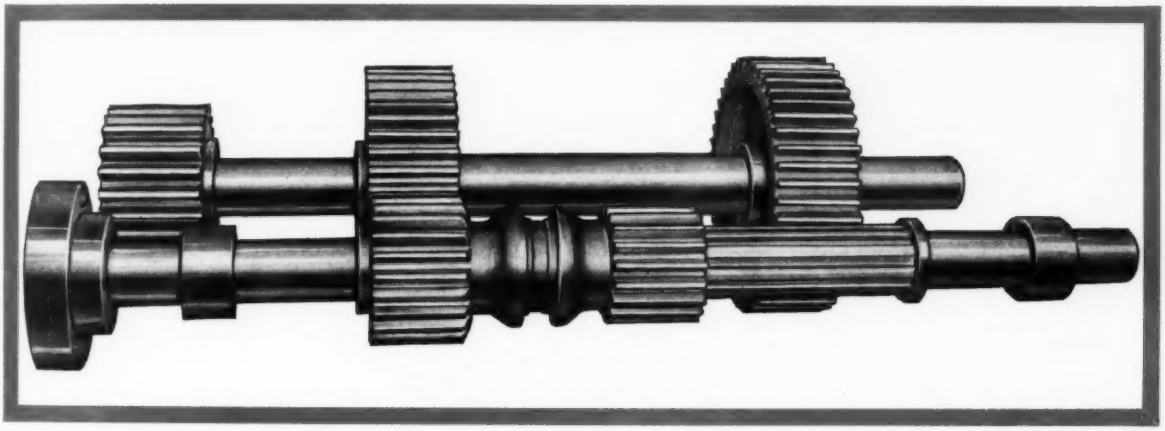

- In service this replacement has actually given more life than the original equipment—with no signs of wear.

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FIBER METALLURGY—A NEW USE FOR METAL FIBERS

A new metallurgical technique which may lead to an entirely new use of metals has been developed at Armour Research Foundation of Illinois Institute of Technology, Chicago.

The technique — known as fiber metallurgy — is unique because it involves the use of a bulk starting form of metal heretofore not used—short metal fibers, according to Dr. Arthur G. Metcalfe, senior metallurgist at the Foundation.

Use of the technique can result in bodies with novel properties and it is possible to make products having a wide range of porosities combined with relatively high strength and toughness.

Filter materials represent only one of the fields of potential use for fiber metallurgy products. Use can be made of their high stiffness-to-mass ratio compared to other bodies.

Applications have been proposed in the aeronautical field. Metcalfe also anticipates metal fibers can be prepared as skeletons to support other materials having special properties. Such additions would include plastics, active catalyst masses, active battery masses, ceramics, and friction materials.

Many of the operations in fiber metallurgy are the same as in powder metallurgy, but one fundamental difference is cited — the use of metal fibers as the starting material.

One of the outstanding properties of fiber metal bodies is that they lend themselves to felting processes similar to the Fourdrinier process used in paper making.

Here's how the felting process operates:

The fibrous material is suspended in a liquid. The fibers are felted, or matted, by pouring the suspension over a filter while applying suction action. Result is that the fibrous material remains on top of the filter while the liquid is drawn through. After drying, the interlocking fibers, or felted material, can be processed in various ways, such as sintering, coining, or impregnating.

It can be pressed to a higher density. Or a brazing material having a lower melting temperature can be added to improve the strength and ductility after a suitable heat treatment.

Tests conducted at the Foundation to compare the tensile and impact strength of fiber and powder metallurgy products have shown the fiber metallurgy bodies have some significant advantages over powder products.

The properties of fiber metal bodies can be adjusted by controlling the methods of manufacture. For instance, the selection of the proper wire diameter and length can be very important in developing the desired properties.

In the aeronautical field, the higher ratio of strength-to-porosity of fiber metal bodies compared with porous powder metal bodies favors its use as part of the airfoil — for example, in the de-icing systems now using porous metals to distribute the de-icing compound uniformly over the wing edge.

Another such use might be in "boundary layer" control, in which the movement of air through the wing surface is used to preserve streamline flow giving increased lift and reduced drag. Another may be for transpirational cooling of jet engine components.

The fiber metallurgy process will be available to industry on a license basis. Interested organizations may write E. W. Wickert, Manager of Licensing Operations, Armour Research Foundation of Illinois Institute of Technology, 10 W. 35th., Chicago, Illinois.

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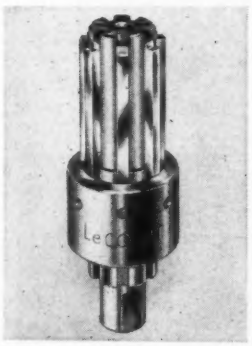
Special Mandrels and Holding Fixtures solve production problems



This Le Count "Special" 7-jaw Mandrel locates in 7 cam grooves of a part requiring precision peripheral grinding. With a Le Count "Special" Holding Fixture for positioning, the operation is now on a production basis.

Le Count "Special" Mandrels are built for threaded, extra long, tapered, splined, polygonal and plural diameter bores. They have guaranteed accuracy of .0002" or .0005" T.I.R. and their unique hand-manipulation feature permits work on weak, thin-section and non-ferrous materials as well as on tough steel. Combined with Le Count "Special" Holding Fixtures, they have solved many locating problems where precision machining, assembly or inspection are performed from the bore.

Write for our literature or send specs and drawings for quotation. **Le Count Tool Works, Inc., 390-T Capitol Avenue, Hartford, Conn.**

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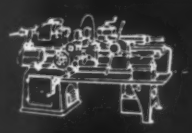

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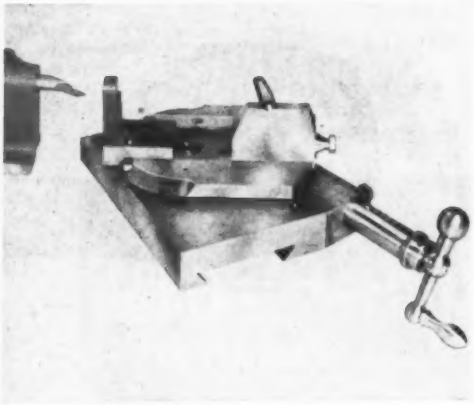
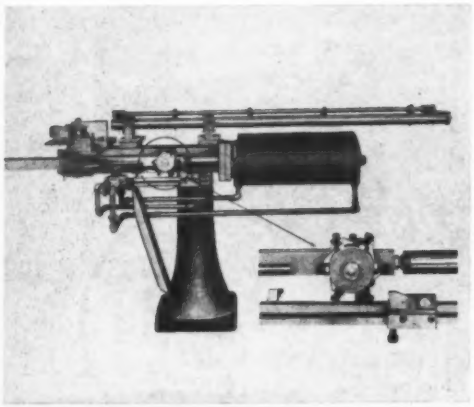


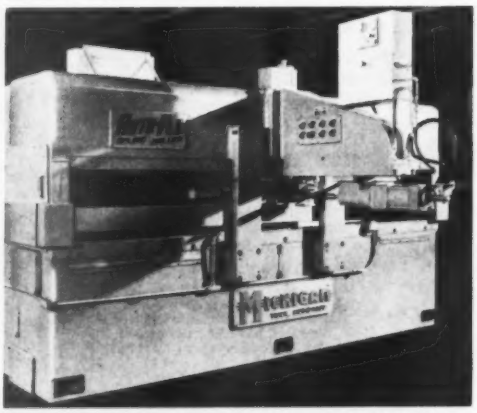
RADIUS TURNING ATTACHMENT . . .

With a capacity from 0 to 4″, a new radius turning attachment allows radius pre-setting to a finished diameter. Designed for use on Wade Lathes, it can be used on other lathes with an adaptor plate not supplied by Wade. The Wade Tool Co., Waltham, Mass., or—**Circle No. A1.**



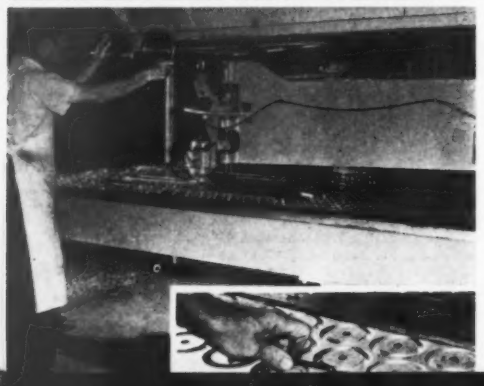
AUTOMATIC RATCHET UNIT . . .

The "Bend-Ex" Bender that makes up to 1000 bends/hr, now has a turret attachment that can be set to make many different angle bends automatically. It has six stations and handles round tubing, light angles, channels, and solid bars. Paul Machine Tool Co., 4600 S. Kedzie, Chicago 32, or—**Circle No. A2.**



NEW SPLINE ROLLER . . .

Cold-form splines and other shapes to 2″ dia. with "Roto-Flo" spline roller, Model 1551. It permits production of parts up to 1½ times the maximum size accommodated on the earlier machine. It forms toothed and grooved shapes on shafts by rolling the piece between two parallel-acting racks. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, or—**Circle No. A3.**

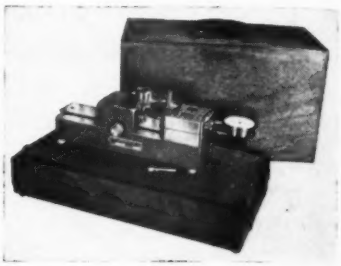


VACUUM CHUCK . . .

The "Octopus Grip" vacuum chuck is shown on a skin milling machine. The upper chuck holds the pattern and the lower, the material. The inset is of suction cups with removable rubber grommets with a screw in the center for a shut-off valve. Pioneer Tool Engineering, Inc., 1601 E. El Segundo Blvd., El Segundo, Calif. **Circle A4.**

PORTABLE GEAR TESTER . . .

For fast, complete production checking of helical, spur, and worm gears, a new portable gear tester has been designed. It can be used for visual checking and also be equipped with a strip-chart recorder to give a permanent record of run-out and tooth-to-tooth errors as low as 0.0001″. The tester is available in three models, one motor driven and two hand operated. Arch Instrument Co., 101 Holmes St., N. Quincy, Mass., or—**Circle A5.**



HAND-OPERATED METAL WORKER . . .

A new manually-operated metal worker will bend, punch, and shear flat and angle metal bars up to 3/16″ thick and flat bars 2″ wide. It can cut both ends absolutely square, with no distortion, fracturing, or knurling. It's primarily for metal fabricating and works equally well with mild steel, aluminum, brass, bronze, and copper. For further information on the Wieland metal-worker, contact Diesel Power, Inc., Greenville, Pa., or—**Inform-A-Gram No. A6.**

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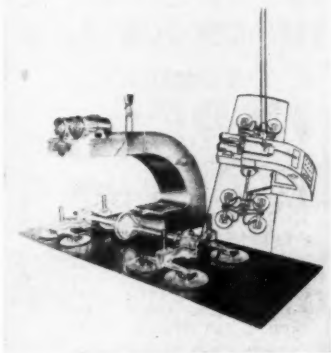
VACUUM SHEET LIFTER . . .

A new 8-cup vacuum roll-over sheet lifter has a lifting capacity of about 14,000 lbs. It can safely handle sheets of non-porous material up to 5′ x 20′ weighing 2000 lbs. A unique feature of the lifter is its ability to rotate the



sheet 180°. Rotation may be stopped at any angle from horizontal to 180° to inspect both sides of the sheet. Larger lifters are available to lift sheets or plates weighing up to 4000 lbs. F. J. Littell Machine Co., 4197 Ravenswood Ave., Chicago 13, or —
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TOOL HOLDERS . . .

Tool changing time is cut when using "Geni" holders and adaptors. With them, the spindle is not stopped to change tools. Drilling and reaming of holes without a pilot bushing on many

applications is possible because of their accuracy. Complete information on the "Geni" line is given in a 98-page catalog from Universal Engineering Co., Frankenmuth, Mich., or —
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Fast, accurate positioning of work from one location to another is made possible by the Advance cross slide rotary table. To be used on all vertical milling machines, it's extremely accurate — ± 1 min. on the rotary table and 0.0005″ on the cross slide. Details are supplied by Morrison Engineering Co., 941 W. Lake St., Chicago 7, or—
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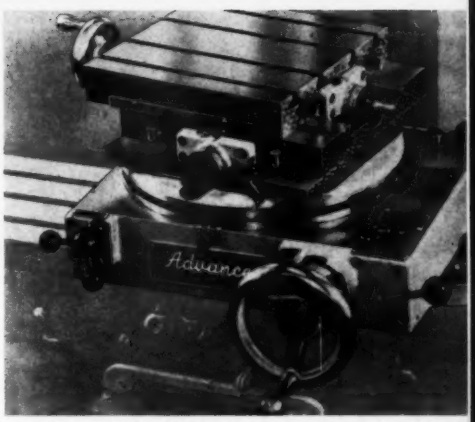
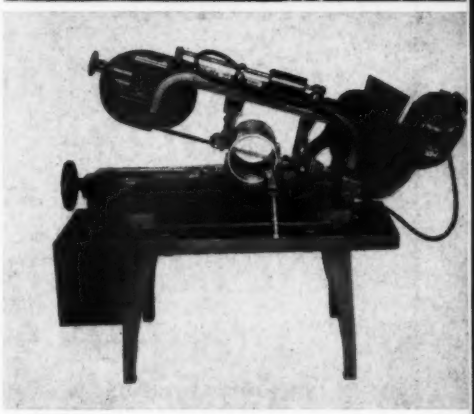


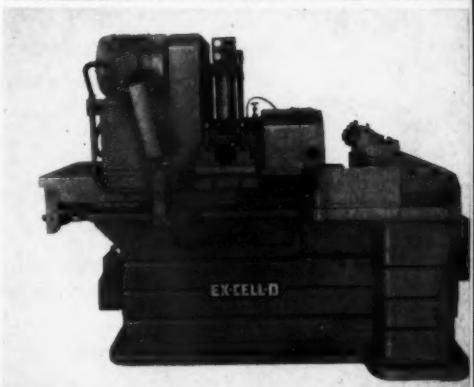
HORIZONTAL BAND SAW . . .

An increased capacity horizontal band cut-off saw is designed for metal cutting on medium production jobs and general utility or tool room work. It features constant-load blade tensioning and automatic stop after each cut. Model 600 will handle 6″ or 6¾″ dia. pipe. Wells Mfg. Corp., 1940 Cedar St., Three Rivers, Mich., or — **No. A10.**



PRODUCE ACCURATE CONTOURS . . .

Accurate contours are turned out on a high production basis by a cam operated precision boring machine. Style 312 is controlled by a pair of cams, one operates the cross slide and the other, the table slide. The machines are used to manufacture gears, industrial motors, etc. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, or—
Inform-A-Gram No. A11.



BARREL FEEDER . . .

A stationary ring cover is featured on a barrel feeder that's adaptable to grinders, presses, primary and secondary machining operations, welding machines, assemblies, etc. It has at least three times the holding capacity of other rotary types. Detroit Power Screwdriver Co., 2801 W. Fort St., Detroit 16, or —
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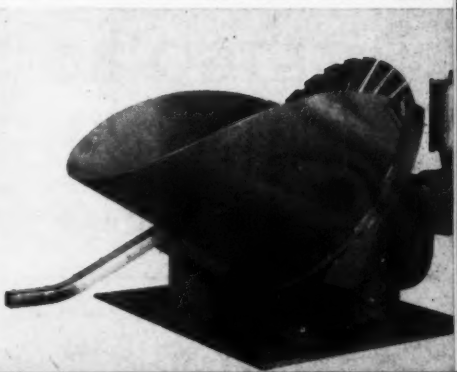

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Write for full information and prices

GATCO ROTARY BUSHING CO.

42322 ANN ARBOR RD., U. S. 12, PLYMOUTH, MICH.

Telephone PLYMOUTH 1472

CIRCLE INFORM-A-GRAM KEY NO. 1921

A STURDY ALL-AROUND TOOL for PRODUCTION JOBS!

M-B

Model U-TR 60,000 RPM UTILITY Pneumatic GRINDER

An outstanding, powerful, fast-cutting tool of proven high efficiency. Designed for the tough jobs and real production. Performs indefinitely and dependably. Precision made. Extra heavy spindle of special alloy steel. Grease-sealed bearings, no manual or automatic lubrication required. Steel housing for safety.

WRITE FOR LITERATURE

M·B PRODUCTS

46 VICTOR AVE., Div. 18
DETROIT 3, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1922

Gage Company PRECISION PLASTIC COMPARATOR SCALES

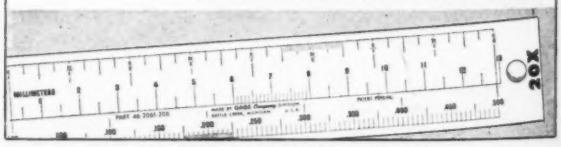
Non-breakable...accurate...designed for making quick measurements at scale on projectors and comparators without any movement of machine or work.

An unexcelled tool for use in drafting and constructing scale layouts for comparator chart use. All standard magnifications and various styles for every application.

WRITE FOR BULLETIN NO. 54-1511

GAGE COMPANY

BATTLE CREEK, MICHIGAN

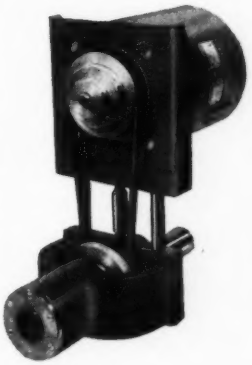


CIRCLE INFORM-A-GRAM KEY NO. 1923

Die Steel, Glass, concrete, granite, quartz, etc., can be drilled with diamond laboratory or thin face bits. The bits can be operated at 250 to 3600 rpm, and are available as surface set or with impregnated diamonds, depending upon the use. Hoffman Bros. Drilling Co., Punxsutawney, Pa., has details on the complete line of diamond bits, or —
Inform-A-Gram No. A13.

A New Line of Parallel Clamps for tool and die makers has been introduced by The Universal Vise and Tool Co., Parma, Mich. It features three extra large models, each with an opening of 6" with jaw lengths ranging from 4¼" to 6¼". "Man-Sized" clamps have quick acting spin nuts and built-in locking and adjusting levers.
Circle No. A14.

Reduce the Drilling Time required with turret lathes and hand screw machines by using the "Tru-Hole Speedy" Drilling Attachment. It can be used with all types of machines, usually realizing a time savings of over 50%. Produced by E. F. Vilter Sales, Inc., 4161 N. Richards St., Milwaukee 12, this attachment has three speeds—715, 1550, and 3350 rpm. Increased drill speed results in faster drilling of deep holes with less drift of the hole.
Inform-A-Gram No. A15.



A Continuous Wire Brushing and grinding operation can be developed with a variation of slides, feeds, lathes, and super precision spindles from Standard Electric. Illustrated is a belted motor-driven precision grinder with a super precision spindle on a vertical slide. This permits positioning of the wheel "on centers". Catalog 20 with detailed engineering data sheets showing layouts of the units is available from The Standard Electrical Tool Co., Mt. Hope & Sixth St., Cincinnati 4, or —
Circle No. A16.

DUSTKOP STOPS DUST

DUST COLLECTO

SAVES INSTALLATION TIME

Stop dust quickly, at lower cost, with Dustkop. Thirty-seven standard models *ready to use* and available from stock. Dustkop conserves floor space, reduces maintenance. Collects almost all types of industrial dusts. Write for descriptive literature.

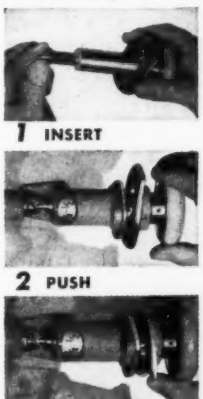
Also a complete line of Mist Collectors

AGET MANUFACTURING COMPANY
1394 East Church St. • Adrian, Michigan

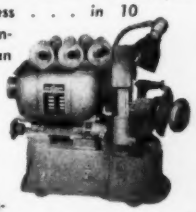
CIRCLE INFORM-A-GRAM KEY NO. 1931

Now! Anyone can GRIND DRILLS

Quickly . . . . Accurately . . . . Easily



The BLACK DIAMOND Drill Grinder restores a worn drill to like-new precision sharpness . . . *in 10 seconds!* Any inexperienced man (or woman!) is an expert grinder with this unit. Both lips ground at once . . . web-thinning equally simple! Pays for itself many times over!



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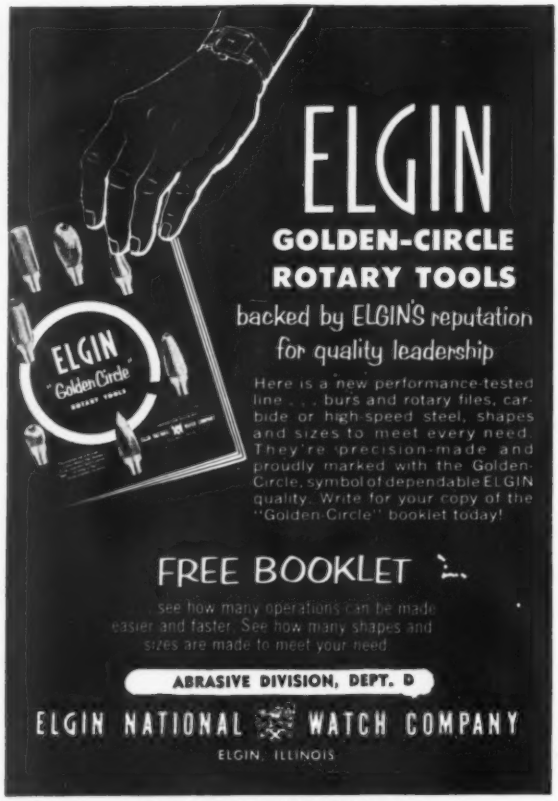
Get all the facts! 4 page illustrated bulletin gives complete story. *Write Today!*

BLACK DIAMOND
SAW & MACHINE WORKS
75 NORTH AVE. NATICK, MASS.

CIRCLE INFORM-A-GRAM KEY NO. 1932



ELGIN

GOLDEN-CIRCLE ROTARY TOOLS

backed by ELGIN'S reputation for quality leadership

Here is a new performance-tested line . . . burs and rotary files, carbide or high-speed steel, shapes and sizes to meet every need. They're precision-made and proudly marked with the Golden-Circle, symbol of dependable ELGIN quality. Write for your copy of the "Golden-Circle" booklet today!

FREE BOOKLET

see how many operations can be made easier and faster. See how many shapes and sizes are made to meet your need

ABRASIVE DIVISION, DEPT. D

ELGIN NATIONAL WATCH COMPANY

ELGIN, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1941

use this special, thin GRIPCO JAM NUT

to get a positive lock on bolts subjected to shearing stresses where the strength of a full nut is not required. The thin GRIPCO Jam Nut locks without the use of lock washers or other parts. The nut itself does the WHOLE job—so shorter bolts can be used. Applicable on such products as valve handles, casters, garden and pruning shears, hedge clippers, sickle bars, etc. GRIPCO JAM NUTS are manufactured in the new Unified Finish and Heavy Series (Hexagon). Furnished in standard full and jam dimensions, in steel, brass and aluminum. *Write for samples and full particulars*

GRIPCO PRODUCTS INCLUDE:
Gripco Lock Nuts, New Gripco "Clinch" Nuts, Gripco Hi-Nuts, Gripco Pilot-Projection and Countersunk Weld Nuts with or without Gripco locking feature.

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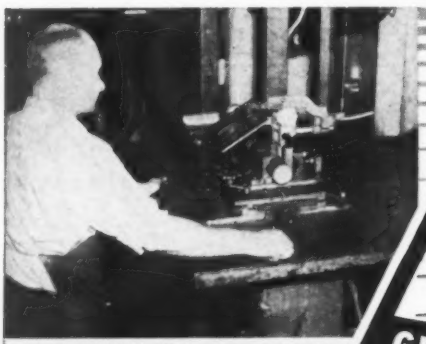
GRIP NUT COMPANY

"after 50 years still holding strong"

308-W S. MICHIGAN AVE., CHICAGO 4, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 1942



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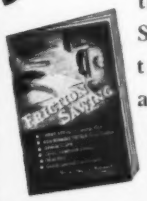
GREATEST COST SAVER IN METAL CUTTING

Write for your free copy of "FRICTION SAWING" and get hep to the fact you can save thousands of dollars and much valuable time by friction sawing with Tannewitz High Speed Band Saws: Sheets of both hard and soft steel, formed or flat; trimming of malleable and steel castings; 1" armorplate and other materials. Write for the "FRICTION SAWING BOOKLET", right NOW!



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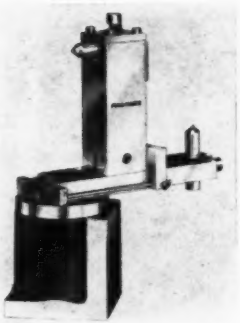
GL-6-1729

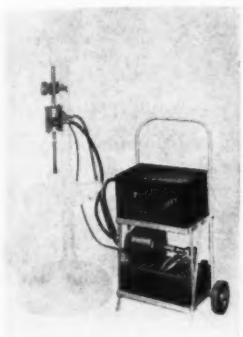
SAWING MACHINERY SPECIALISTS

The TANNEWITZ WORKS GRAND RAPIDS MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1943

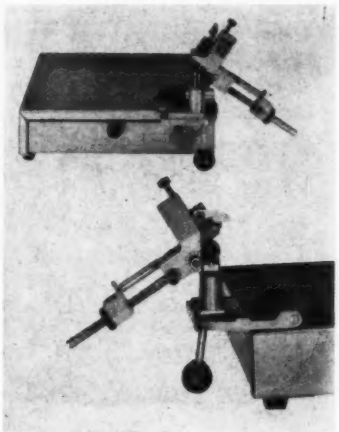
A Heavy Duty Wheel Dresser has been announced by J & S Tool. The new "Form Master" Wheel Dresser, a low cost unit for close, precision work, can take up to an 8" convex radii and to a 12" concave one on an 8" wheel. Drilling and tapping of holes are possible in the cast iron base when needed for quick set up on cylindrical grinders. J & S Tool Co., Inc., 87 Dorsa Ave., Livingston, N. J., or — **Inform-A-Gram No. A17.**



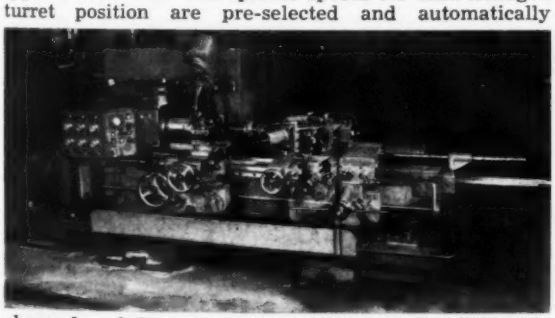


Fast, Efficient Operation without the use of electronic tubes, rectifiers, or condensers is possible with a new type of metal disintegrating machine. Model A-1 machine will remove imbedded, broken taps or drills up to ¾" diameter with speed comparable to that of other machines costing up to ten times more. Jiffy Disintegraters, Inc., 109 E. Nine Mile Rd., Ferndale 20, Mich. **Inform-A-Gram No. A18.**

Take the Guess Work Out of drill sharpening with a scientifically designed drill kit. The drill to be sharpened is held in a sliding "V" block. A three-way drill point gage checks the angle ground and selects the right drill for the work in hand. Also included is an illustrated instruction manual. Swanson Mfg. Co., 1236 Sherman Ave., Evanston, Ill., or — **Circle No. A19.**



A 32-Speed Headstock with two ranges, each with 16 forward and reverse speeds powered by a 40-hp single speed motor, is one of the features of a universal saddle type turret lathe. The spindle speeds for each hexagon turret position are pre-selected and automatically



changed, and the turret is motor indexed. The lathe improves production through correct cutting speed control and reduced machine idle time. Jones & Lamson, Springfield, Vt., or—**Circle Inform-A-Gram No. A20.**

NOTCH THESE ENDS WITH ONE STROKE OF PUNCH PRESS

ARC-FIT TWIN-NOTCH

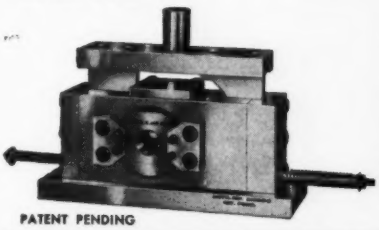
NO DEFORMATION Shears from inside out—cuts clean edges; eliminates need for further finishing; aligns notches automatically.

PERFECT "T" Joints for welding or brazing.

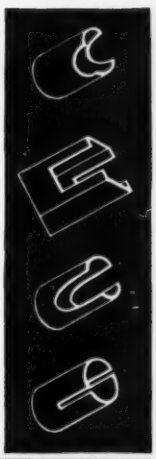
PRODUCTION NOTCHING Actual production time per pipe or tube end reduced to less than 3 seconds.

INTERCHANGEABLE Punches and dies up to 2¾" O.D. pipe or tube for STANDARD TWIN NOTCH. (Special units available up to 3" O.D.)

SEND FOR DESCRIPTIVE LITERATURE



PATENT PENDING



VOGEL TOOL AND DIE CORPORATION

1817 N. 32nd Ave. Melrose Park, Illinois

FIllmore 5-0160

CIRCLE INFORM-A-GRAM KEY NO. 1951

FOR POSITIVE STOCK ALIGNMENT

IN PROGRESSIVE DIES

Amcor Roller Stock Pushers

SPEED UP PRODUCTION with precision-made AMCOR Roller Stock Pushers. Easy, smooth stock feeding, without buckling, assures more production with less operator fatigue.

SAVE MONEY. AMCOR Roller Stock Pushers sell for just a fraction of what hand-made bench models cost to make.

SIMPLE TO INSTALL. Requires only a slot milled in the stripper plate, and a hole drilled in the die block and stripper plate. Tracing template for slot and hole location is supplied. When die is sharpened, no refitting is necessary.

The AMCOR Roller Stock Pusher is quickly adaptable to any work specifications. Distributors throughout the country stock a complete line of nine models to fit all production needs.

Write us for complete information

APPLIED MECHANICS CORPORATION

460 LYON, N. E. GRAND RAPIDS MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1952

Tough grinding jobs?

Check *Vulcanaire* high speed precision grinding heads!

Grinding circular slot using Vulcan's Rotary Table and Magnetic chuck.

Many seemingly impossible grinding problems have been solved by adapting Vulcanaire to standard machines or by using one of Vulcan's specially designed machines.

On Surface Grinders, merely remove wheel and guard, clamp vertical or horizontal adaptor to machine as illustrated. No belts necessary. For instance, Vulcanaire used in connection with Vulcan's Rotary Table for Surface Grinders permits the grinding of a circular slot.

Vertical adaptor for Surface Grinders. Grinding small slots

Adaptors are in stock to fit the spindle of Vertical Milling Machines for grinding contours, holes and slots.

On Internal Grinding Machines Vulcanaire's infinitely controlled speeds furnish the correct surface cutting speed resulting in faster production and micro finish. The adaptor sleeve fits into present housing.

Applied to Jig Boring Machines, Vulcanaire is liked by leading precision manufacturers because its accuracy is guaranteed, producing Vulcanaire jig grinding of large and small parts.

Horizontal application. Grinding a shoulder Punch.

Send us a blue print on your toughest grinding problem. Recommendations and sketches will be returned to you — no obligation.

Major Vulcan Services

Engineering, Processing, Designing and Building... Special Tools... Dies . . . Special Machines . . . Vulcamatic Transfer Machines . . . Automation . . . including the Vulcan Hydraulics that Form, Pierce, Assemble and size. . . . Vulcanaire Jig Grinders . . . Motorized Rotary Tables . . . Plastic Tooling.

VULCAN TOOL CO.

741 LORAIN AVE. • DAYTON, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1961

Geneva Dial Indicators for Precision Production

Test Sets for Machinists, Tool Makers and Inspectors

.001" .0005" .0001" Dial Indicators with Exclusive lever action

Since 1896, Geneva Precision Instruments have been used for precise checking.

Complete line includes:

Dial Indicators — Test Sets
Bench Center Sets — Depth Gages
Dial Indicators with Threaded Stem
Regular Test Sets — 4" and 8" Base
with solid, adjustable & "T" slot uprights
Production Bench Gage — Dial Snap Gages
Test Set with Magnetic Base

16-page illustrated Catalog 106 sent FREE on request.

CHICAGO DIAL INDICATOR CO.

DEPT. A, 180 N. WACKER DRIVE, CHICAGO, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 1962

When New Molds Stick use IMS SILICONE FLUID

For Better Tool and Die Lubrication!

Shorten costly break-in periods! Simply spray on this perfect parting agent from self-dispensing aerosol! Useful too in PATTERN MAKING — releases patterns from master molds with minimum surface defects. Remember . . .

WHERE ANYTHING STICKS
it always pays to try
IMS SILICONE SPRAY

Get new tools into production sooner. Keep a few cans handy all the time. Order today!

DELIVERED PRICES

Single Can $2.00
Unbroken Dozen . . . $18.00
Unbroken Gross . . . $197.40

INJECTION MOLDERS SUPPLY CO.

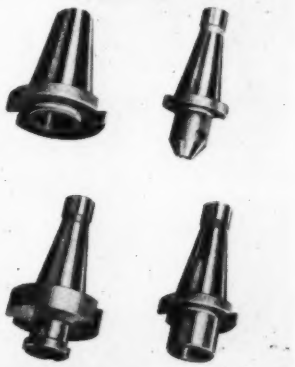
3514 LEE ROAD WYoming 1-1424 CLEVELAND 20, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1963

Readings Accurate To 0.0001" are made with a direct reading micrometer. There's no parallax error because the graduation lines on the thimble and sleeve are side

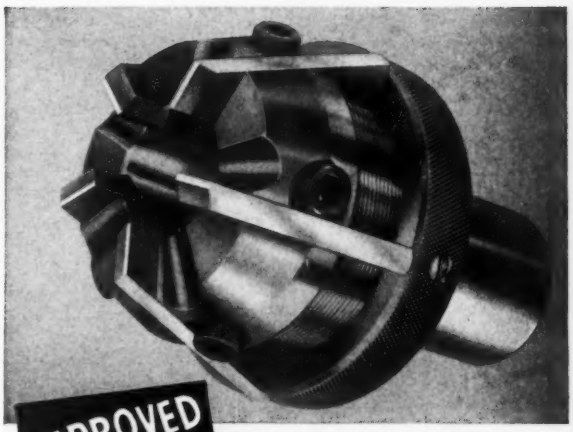
by side, not one above the other. This Swiss precision measuring tool is available from Ernest E. Diener Co., 4779 Korte Ave., Dearborn, Mich. **Circle No. A21.**

Single and Double End Mill Adapters, tang drive tapered socket adapters, drawbar type tapered socket adapters, and shell end mill arbors are included among the new tool holders added to the Universal line. Work can be held to close tolerances. They're listed in a 98-page catalog from Universal Engineering Co., Frankenmuth, Mich. **Circle A22.**



A New 7½-Ton, Deep-Throat Power Press has been produced by Kenco Mfg. Co. Model 7R rigid rib style press is a companion to the Model 7 standard one. It's designed for punching, blanking, forming, stamping, and drawing of plastic and sheet metal. It features a 12¾" throat. Kenco Mfg. Co., 5211 Telegraph Rd., Los Angeles 22, or **Circle No. A23.**

Precise Control Over Inching is a major feature of a new hydraulic press for die tryout and pilot production runs. This press combines hydraulic action with gap frame design. Available in 50 to 250 ton capacities, it's produced by E. W. Bliss Co., Canton, O. The stroke is longer than that for standard Bliss inclinable presses, compensating for die space and press set-up adjustments. **Circle A24.**



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GENESEE
Adjustable Hollow Mill

There is a size and style Genesee for every hollow milling job. Standard sizes from 0 to 2", standard with straight or Morse Taper shanks carried in stock.

- Quick — easy adjustment
- Simple sharpening method
- High speed steel—cast-alloy — Carbide tipped blades
- Let our Engineering Department solve your Production tool problems

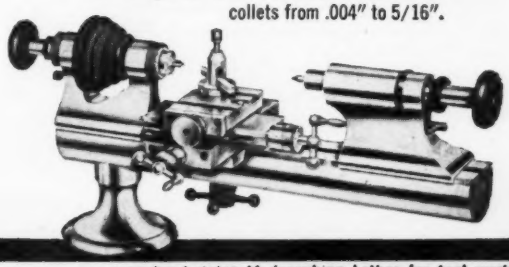
WRITE FOR CATALOG 55P

GENESEE MANUFACTURING COMPANY
566 HOLLENBECK ST. • ROCHESTER 21, N. Y.
Adjustable Hollow Mills • Facing and Counterboring Tools • Special Production Tools

CIRCLE INFORM-A-GRAM KEY NO. 1971

SMALL INSTRUMENT PARTS ARE MADE BEST ON *LEVIN* LATHES ®

Twenty-three models for all types of work. 4" swing, Bed Length 12" or 18"; over 100 stock sizes of collets from .004" to 5/16".



Send for Catalog M describing Lathes for tool work, second operations; turrets and full line of accessories.

LOUIS LEVIN & SON, INC., 3610 S. BROADWAY, LOS ANGELES 7, CALIF.

CIRCLE INFORM-A-GRAM KEY NO. 1972

You're not gambling
IF you have an **ACE in the hole!**

ACE DRILL BUSHINGS are always a sure bet!

- *Quality* • *Accuracy*
- *Largest Deliverable Stocks Anywhere!*

Over 22,000 sizes, types and specifications in A.S.A. and ACE standards, micro and super sizes plus bushings for embedment in plastic or castable material.

Write For Catalog F

ACE DRILL BUSHING CO., INC.
5407 Fountain Ave., Los Angeles 29, Calif.

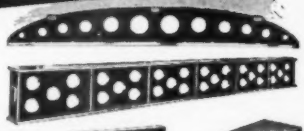
CIRCLE INFORM-A-GRAM KEY NO. 1981

CHOOSE CHALLENGE . . .
and be precision sure!

CHALLENGE SURFACE PLATES

New! Clovis Black Granite
Rated Class A. Surface accuracy guaranteed. 24 sizes.

Special Analysis Semi-Steel
Fine grain. Precision ground or hand scraped.



STRAIGHT EDGES for lathe bed ways. PARALLEL STRAIGHT EDGES for inspection of alignment.

UNIVERSAL BOX ANGLES Parallel to within .00025-inch.

V-BLOCKS V accuracy of .0005-inch.

ANGLE PLATES In 22 sizes for clamping & holding work.

BOX PARALLELS In every size for every use.

782

THE CHALLENGE MACHINERY COMPANY
Office, Factories and Show Room:
GRAND HAVEN, MICHIGAN
DEALERS IN ALL PRINCIPAL CITIES

CIRCLE INFORM-A-GRAM KEY NO. 1983

Use CROBALT cast alloy tools!

CROBALT cast alloy cutting tools outwear and outproduce HSS . . . withstand shock and vibration far better than carbides . . . give 15% to 35% more pieces per grind than other cast alloys! They've been proven through 23 years in the largest metalworking plants; and today they're better than ever. Try them and see!

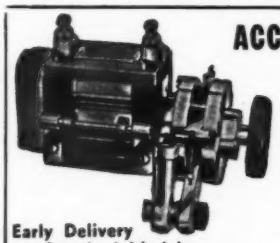
FREE CROBALT BULLETIN
describes the conditions where cast alloy tools are BEST — and tells how to use them to full advantage. In it, you may find the way to higher production at lower cost. Write for *Bulletin 101.*

DISTRIBUTORS: We invite your inquiries.

Crobalt, Inc.
2800 S. State St., Ann Arbor 5, Michigan

West Coast: 111 Eucalyptus Dr., El Segundo, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 1982



ACCURACY with SIMPLICITY and LOW COST with "RFC" ROLL FEEDS

Models to fit:
ANY PRESS
FOR ANY JOB
FOR STOCK UP TO 12" WIDE

Early Delivery on Standard Models

"RFC" ROLL FEEDS are quality built for long, dependable service.

Write for descriptive literature

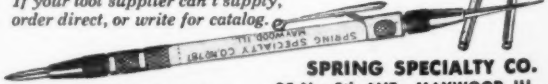
ROLL-FEEDS CORPORATION
Pawtucket, Rhode Island
An Electrix Affiliate

CIRCLE INFORM-A-GRAM KEY NO. 1984

No. 676 SINGLE POINT $1.50

LEIGH *Carbide* SCRIBERS

Marks hardened steel, ceramics, plastics, gems, glass, etc. Polished aluminum body. Black-finish steel screw collets hold the points, easy to reverse for safety or adjust for length. Carbide point is ¾" diameter carbide rod approximately ½" long, copper-brazed into steel, ground to a point, and hand-polished, CAN BE RESHARPENED MANY TIMES. Steel point is hardened, and centerless ground to a long taper.
If your tool supplier can't supply, order direct, or write for catalog.

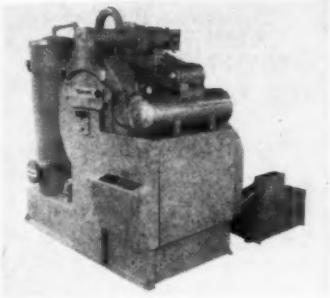


No. 787 DOUBLE POINT $2.50

SPRING SPECIALTY CO.
25 No. 5th AVE., MAYWOOD, ILL.

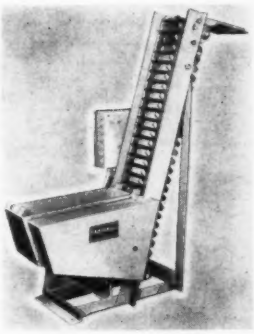
CIRCLE INFORM-A-GRAM KEY NO. 1985

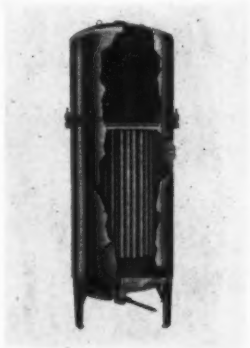
A Newly Designed Open Side Tool Holder with time-saving features is being manufactured by The Wade Tool Co., Waltham, Mass. One tightening of the wrench locks the ⅜" square tool bit and tool block securely in place. This tool holder has the flexibility of the standard yoke type combined with the rigidity of the conventional open side. **Inform-A-Gram No. A25.**



Oil-Free Air is delivered up to 175 psi pressure by a new type air compressor. It features graphite or carbon piston rings instead of steel ones. Shown is a Mercury dry cleaning machine with a B & G compressor and tank. Bell & Gossett Co., Morton Grove, Ill., or — **No. A26.**

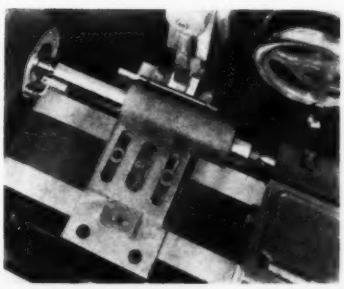
Designed to Handle Short Bars, studs, etc., up to 6" long, a new elevating bar feeder takes parts from the magazine, elevates them, and presents them for feeding to the next production machine, making it fully automatic. Delivery rate can be varied from 1 to 12 pcs/min. Model 4000 employs blade, elevating, vibratory, or rotary feed as may be required. Feedall, Inc., Willoughby, O., or—**Circle A27.**



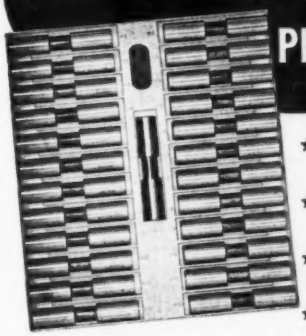


High Flow Filtration for water-based or mineral oil coolants used in drilling, honing, and lapping is a feature of a new pre-coat filter. Its backwashing technique eliminates manual cleaning. Use of tubular screens instead of flat ones reduces tank diameter 30%. For complete details on the pre-coat filter, contact Houdaille-Hershey of Indiana, Inc., 248 Superior Ave., Lebanon, Ind., or—**Circle No. A28.**

Any "Between Centers" Grinding Machine can be converted to a centerless grinder with the S & E Centerless Grinding Fixture. With it, form, in-feed, through-feed, and plunge cut operations are possible. S & E Machine Products, Inc., Bridgeport, Mich. **Circle No. A29.**



CLOSER TOLERANCES with DELTRONIC TENTH PLUG GAUGES



★ Size variation by ten thousandths

★ Set of 25 costs approximately same as Go and No-Go gauge.

★ Available in increments of 1/64" from 1/8" to 1"

★ Hardness is Rockwell C62/C64

This new system of precision gauging provides one gauge of nominal size plus 12 gauges of increasingly larger sizes in .0001" increments and 12 gauges of decreasingly smaller sizes in increments of .0001". Each gauge is identified. It is the same size on both ends to double the life in usage.

For further information write Dept. D1.

DELTRONIC CORPORATION
1507 RIVERSIDE DRIVE • LOS ANGELES 31, CALIF.

CIRCLE INFORM-A-GRAM KEY NO. 1991

RELOCATE AUTOMATICALLY FOR SECOND OPERATION-BORING WITH BLACK "CENTR-FINDER" VISE

Relocating for second operation-boring is fast and accurate with a Black "Centr-finder" vise. Locates centers and other pre-determined points within .001" vertically and horizontally, regardless of shape or size of parts. A versatile tool—for drilling, reaming, chamfering and many other operations.

Working range is 0 to 4". Clamping pressures up to 2000 pounds. Force exerted is all straight line. Vise jaws travel on guides—actuated by opposed double-acting cylinders . . . synchronized by mechanical means. No pressure exerted through synchronizing mechanism.

Get all the facts—write for bulletin.

THE BLACK DRILL COMPANY, INC.
1368 East 222nd Street • Cleveland 17, Ohio
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free! DON'T MISS FIELD REPORTS 18 & 24

on MOLYKOTE® LUBRICANTS in Tooling and Production

Actual case studies from our customer files . . . see how others solve the lubrication problems you meet every day . . . write now

The ALPHA MOLYKOTE *Corporation*

Main factories:
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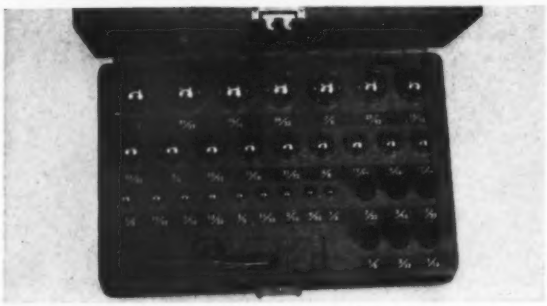
CIRCLE INFORM-A-GRAM KEY NO. 2001

SETS of Super-Precision MASTER BALLS



- Provide HIGH ACCURACY at NOMINAL COST
- SAVE TIME in Shop and Tool Room

Sets consist of 31 hardened chrome steel balls ranging from 1/16" to 1" diameter by 1/32" steps — all accurate to .000010" on size and sphericity. As illustrated — $65.00.

FREE 8-PAGE BULLETIN tells applications; gives methods and formulas for *simplified checking* of internal tapers, ID's, hole depth, etc. *Write for Bulletin 552 — today!*

INDUSTRIAL TECTONICS, Inc. ANN ARBOR 7, MICH.

ITI PRECISION BALLS
All Materials — All Sizes
In Large or Small Quantities

CIRCLE INFORM-A-GRAM KEY NO. 2002

Powered by the press ram... independent of the die

2 SIZES Cuts steel up to 1/16" thick

3" WIDE $69 6" WIDE $95

Guaranteed — money back if not 100% satisfied

New LOW prices on the JACO AUTOMATIC STOCK REEL

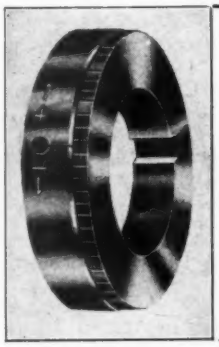
WRITE FOR FULL DETAILS TODAY!

Dealer Inquiries Invited

JACO DEVICES, INC.

96 HIGH STREET • HINGHAM, MASS.

CIRCLE INFORM-A-GRAM KEY NO. 2003



MILLING MACHINE SPACING COLLARS

SAVE TIME

ON GANG MILLING SET - UPS

These MICROMETER ADJUSTABLE SPACING COLLARS are designed for accurate spacing of side milling cutters, gang milling and various other multiple setups on milling machines. Accurate spacing of the milling cutters is easily made by merely loosening the cutter arbor nut and making a plus or minus adjustment.

You will be assured of a QUICK, ACCURATE and POSITIVE ADJUSTMENT at all times.

For immediate delivery specify size and mail orders to . . . . . .

Size of Cutter Arbor	Maximum Outside Diameter	Price
7/8	1-9/16	$11.50
1	1-13/16	11.50
1 1/4	2-1/16	12.25
1 1/2	2-7/16	12.25
1 3/4	2-3/4	14.50
2	3-1/16	16.50

DAYTON ROGERS *Manufacturing Company*

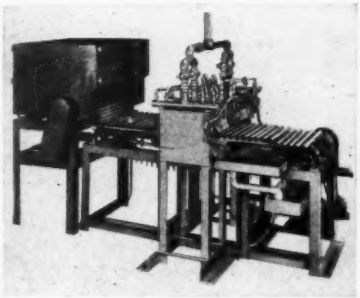
MINNEAPOLIS 7 8, MINN.

CIRCLE INFORM-A-GRAM KEY NO. 2004

Perfectly Finished Holes are said to be produced by a new taper shank rotary broach which rotates as it cuts. The broach replaces reamers and broaches and often eliminates another operation, such as lapping

or grinding. These tools are being made in sizes from ¼" to 1" in increments of 1/32", and from 1/16" to 1½" by 1/16". Shearcut Tool Co., 7045 Darby Ave., Reseda, Calif., or — **Circle Inform-A-Gram No. A30.**

Speed Up End-Annealing Production of brass tubes—for sink traps, for example—with a new gas-fired high speed heating unit. Both tube ends are heated simultaneously to a specified length, prior to bending or



flaring. The unit will heat from ½" to 7" of each end of the tubes and will handle 1" to 2" diameters with 12" to 36" lengths. Gas Appliance Service, Inc., 1211 Webster Ave., Chicago 14, or—**Circle No. A31.**

A Micro-Positioner providing a completely automatic method of locating production parts under all types of vertical spindle machine

tools, has been produced. It will provide greater speed and accuracy, reduce setup time, and cut costs. Tolerances can be held within 0.0003". Topp Industries Inc., 5255 W. 102nd St., Los Angeles, or — **Circle Inform-A-Gram No. A32.**

Specify DURANT

PRESS ROOM EQUIPMENT

Write Now
for new catalog showing prices and complete line of Equipment.

DURANT Tool Supply Co.
136 SOUTH WATER STREET, PROVIDENCE 3, R. I.

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DON'T SCRAPE DON'T SCRAP worn surface plates them either . . .
Step them down and continue using them for less accurate work.

You'll save enough money to replace with Rahn Diabase for your most accurate work.

It's being done. Many companies have adopted this NO COST way of converting from metal to Rahn Diabase (black granite) Surface Plates.

PROVE IT YOURSELF... FREE 30 DAY TRIAL
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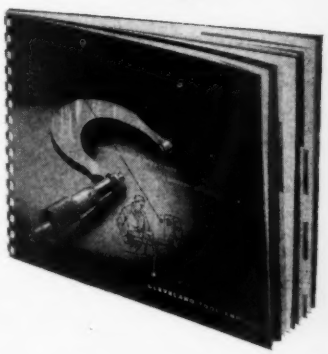
if your production calls for PRECISION TOOLING...

you need this BROCHURE



Our scope of activities, as outlined on the various pages of this brochure are important to you — they provide ideas on the new concept of tooling — the phases of which no manufacturer can ignore, the stability of an organization whose skill and ability are vastly aiding industry to greater precision and production than ever before possible. It costs no more to work with the Leaders of the Industry — put Cleveland Tool and Die on your suppliers list — now.

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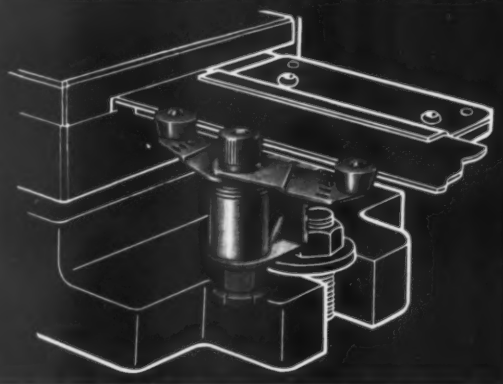
CIRCLE INFORM-A-GRAM KEY NO. 2013

NOW...
A Low-Cost Stock Guide



NEW DANLY ROLLER STOCK GUIDES AND GUIDE RAILS

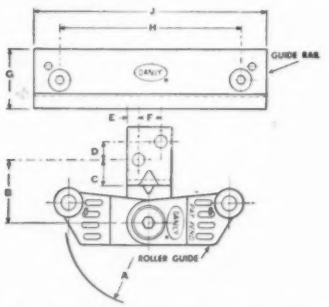
READY MADE—QUICK TO INSTALL

Versatile...for use on dies or in any operation where coil or strip stock must be guided.

Low-cost...the cost is only a fraction of the shop expense necessary to tailormake a guide.

Rugged...constructed entirely of steel. Rollers, arms, collar and bracket are hardened. Adjustable, three-coil music wire spring.

Roller Guide, Large.....$4.50 each
Roller Guide, Small.....4.00 each
Guide Rail.....$3.50 box of five (all one size)
(Discount for quantity orders)



Roller Guide Dimensions, Inches

	Cat. No.	A	B	C	D	E	F
Roller Guide Large	9-70-6	2 3/4	1 15/32	5/8	1/4	5/16	7/16
Roller Guide Small	9-60-6	1 27/64	1 1/16	7/16	5/16	3/16	3/8

Danly Roller Stock Guides packed one to a box unassembled, furnished with light or heavy-duty spring for optional use plus all necessary mounting screws and mounting instructions.

Guide Rail Dimensions, Inches

	Cat. No.	Max. Stock Thickness	G	H	J
Guide Rail	9-8025-6	.025	1	3 1/8	4
	9-8045-6	.045	1	3 1/8	4
	9-8080-6	.080	1	3 1/8	4
	9-8125-6	.125	1	3 1/8	4

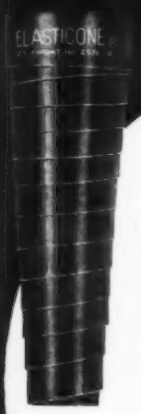
Danly Guide Rails packed five of one size per box, furnished with mounting screws and dowel pins.

For immediate delivery, specify catalog number and mail orders to

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue • Chicago 50, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 2021

MAJOR AIRCRAFT MAKERS SAVE $954,000. ON DIES EQUIPPED WITH



ELASTICONE
GUIDE PIN COVERS

The facts speak for themselves and show how all industries are now reducing costs of die programs by using Elasticones for closing the gap between pins and bushings, protecting dies against breakage, reducing the need for spare dies. *Low costing* Elasticones are available to fit most pins and bushings.

Write for complete literature and technical data.

CENTRAL Safety Equipment Co.
6603 MARSDEN ST. PHILADELPHIA 35, PA.

CIRCLE INFORM-A-GRAM KEY NO. 2022

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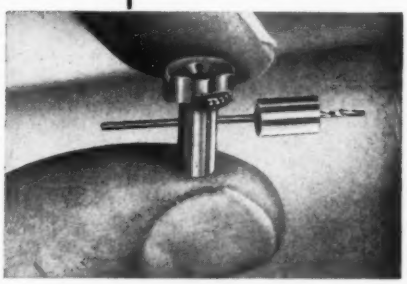
*ULTRA PRECISION BUSHINGS . . .

For gauge assemblies, flow orifices, wire drawing dies, etc. Guaranteed accuracy to .0001 in bores up to 3/8" long.

★ With Micro Drill Guides



Special Holes are Standard!

No change in price or delivery for metric and special hole sizes in STANDARD MICRO DRILL GUIDE RANGE OF #80 to 3/32" in listed body sizes.

LONGER LIFE

No counter bore . . . diamond lapped hole with full length drill bearing.

Also Available

- Special Micro Drill Guides with body sizes other than those listed and hole sizes not in the standard ±80 to 3/32" range.
- Job micro-drilling of your parts.
- Engineered MICRO-TOOLING, drills, jigs, collets, etc.

MICRO DRILL GUIDE
JEDCO
3980 SUPERIOR AVENUE CINCINNATI 38, OHIO

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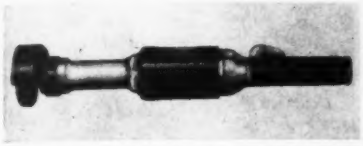
We Now Have Some Areas Available. Contact Us Immediately.

CIRCLE INFORM-A-GRAM KEY NO. 2023

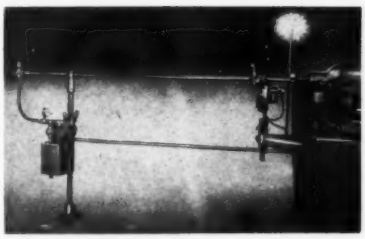
Accurate Grinding using a tool post holder as well as heavier work using 4" or 6" organic wheels may be handled by two new horizontal grinders. They're made in five speeds and can



be used with wire brushes or roll abrasives. Complete information is found in a pocket-size catalog from Buckeye Tools Corp., Div'n 19, P. O. Box 966, Dayton 1, O., or—**Circle Inform-A-Gram No. A33.**

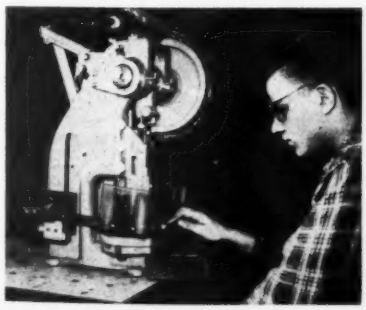
Expanded and More Economical Production of a great variety of plastic products and industrial parts is possible with the "Vac-Form" Model 88, vacuum forming machine. The machine uses molds of plastic, wood, metal, or plaster to shape many types of thermo-plastic films and sheets. It's produced by Vacuum Forming Corp., 76 S. Bayles Ave., Port Washington, N. Y. **Circle A34.**

The Improved "Hydra-Lite" Hydraulic Bar Feed is now available. The size range has been increased to handle stock diameters from ⅜"-1½". The piston on this model is



returned to the rear of the stock tube semi-automatically. Circulars on the new bar feed are supplied by Boyar-Schultz Corp., 2000 S. 25th Ave., Broadview, Ill., or—**Circle No. A35.**

A Drop Gate Electro Solenoid Guard has been added to the Searjeant line of punch press safety equipment. When down, it surrounds the die area to prevent reach-



ing in the ends. Units are available for all size presses from bench types to presses of 100 ton and over. Searjeant Metal Products Inc., 71 Pittsford Rd., Mendon, N. Y., or —**Circle Inform-A-Gram No. A36.**

Over 85% of the torque wrenches used in industry are
STURTEVANT
TORQUE WRENCHES
Read by Sight, Sound or Feel.
• Permanently Accurate
• Practically Indestructible
• Faster—Easier to use
• Automatic Release
• All Capacities
in inch grams...inch ounces...inch pounds ...foot pounds
(All sizes from 0-6000 ft. lbs.)
TORQUE MANUAL
Every manufacturer, design and production man should have this valuable data. Sent upon request.
PA STURTEVANT CO

CIRCLE INFORM-A-GRAM KEY NO. 2031

REPUBLIC

TWIST DRILLS
REAMERS

Whether it is for No. 40 holes in Titanium sheets for Jets or 1 3/16" holes in thick armor plate, Republic Drills give more holes per drill and more holes per hour of direct labor.

REPUBLIC DRILL & TOOL CO.
DIVISION OF AVILDSEN TOOLS & MACHINES, INC.
MAKERS OF "CELFOR," "CENTURY," "REPUBLIC" AND "U.S. EAGLE" BRAND TOOLS

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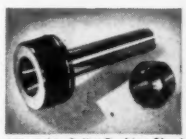
SOUTH BEND LATHE ATTACHMENTS

- Increase Lathe Versatility
- Simplify Difficult Jobs
- Perform Special Classes of Work

Handlever Collet Attachment

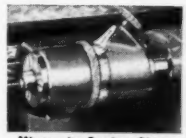
Telescopic Taper Attachment


Adjustable Collet Bushing Chuck

Steel and Brass Collets

Safety and Standard Lathe Dogs

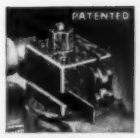
Telescoping Jaw Follower Rest and Center Rest


Micrometer Carriage Stop

Handwheel Collet Attachment

Milling Attachment

Ball Bearing Live Center



10 in 1 Tool Holder

Thread Dial Indicator

External Grinder

Centers, Drill Pads

Write for Catalog 5205
SOUTH BEND LATHE
Building Better Tools Since 1906
South Bend 22, Indiana

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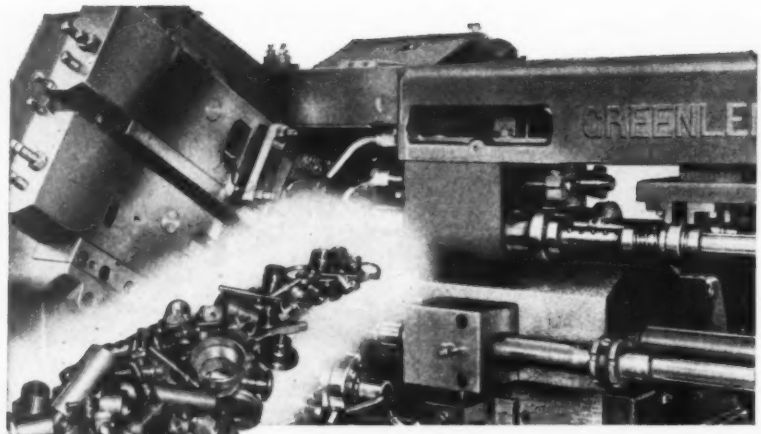

PRODUCTION VERSATILITY

ON A GREENLEE 6-SPINDLE AUTOMATIC BAR MACHINE

Greenlee Automatics provide accurate and fast production of an almost endless range of parts. Standardized tooling, wide open tooling area, interchangeable cross-slide cams, built-in threading drive, rapid stroke-setting and other Greenlee advantages provide great versatility, assure a quick and generous return on your equipment investment.

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ROCKFORD, ILLINOIS

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"IMPERATOR"

PARALLELS and "V" BLOCKS

The Jewel of Magnetic Accessories
Pat. Pend.

PARALLELS

CODE	SIZE	MATCHED PAIR*
IP2	1x2x2	$16.50
IP3	1x2x3	19.50
IP4	1x2x4	22.50

"V" BLOCKS

CODE	SIZE	MATCHED PAIR*
IV2	1¾x2½x2	$22.50
IV3	1¾x2½x3	33.75
IV4	1¾x2½x4	45.00

*Includes hardwood box

Also available for Hanchett Magna-Lock Chucks at slightly higher price.

NOW AVAILABLE IN SETS!

SET No. 1
1 pr. Matched IP4 ..... $22.50
1 pr. Matched IV2 ..... 22.50
COMPLETE with plywood box **$41.60**

SET No. 2
1 pr. Matched IP3 ..... $19.50
1 pr. Matched IV3 ..... 33.75
COMPLETE with plywood box **$49.00**

SET No. 3
1 pr. Matched IP4 ..... $22.50
1 pr. Matched IV4 ..... 45.00
COMPLETE with hardwood box **$61.60**

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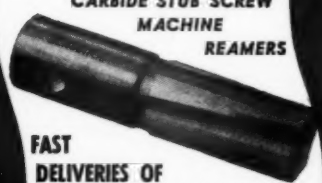
PV DIV., P.O. BOX 6715. CLEVELAND 1, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 2043

NOW AVAILABLE IN DECIMAL SIZES!

Schmarje

CARBIDE STUB SCREW MACHINE REAMERS



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Better finish . . . greater accuracy . . . lower tool cost! *Write today for specifications and prices.*

SCHMARJE TOOL & ENGINEERING CO.
Carbide Reamers • Form Tools
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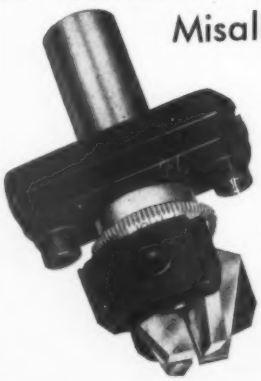
CIRCLE INFORM-A-GRAM KEY NO. 2044

Compensates for Spindle Misalignment

KUTMORE ADJUSTABLE HOLLOW MILLS



The Midget Floating Holder Hollow Mill, flange type, has micrometric adjustment, and is designed to permit easy compensation for any spindle misalignment.

WRITE TODAY FOR CATALOG 20-TD

It shows complete line of adjustable hollow mills. Our engineering department is at your disposal for special requirements.

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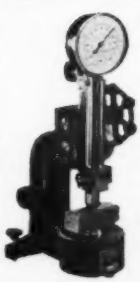
CARL WIRTH & SON, INC.
ROCHESTER 5, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 2042



HARDNESS TESTING

has been done with the SCLEROSCOPE Since 1907

THE SHORE INSTRUMENT & MFG. CO., Inc.
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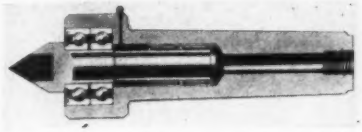
CIRCLE INFORM-A-GRAM KEY NO. 2045

Tungsten Carbide Tips are featured on a new line of Cross Live Centers. They increase live center life 5 to 10 times, retaining a ± 0.0001" accuracy for a longer time. These centers are designed to with-



stand the higher speeds and increased pressures set up by carbide cutting tools. Herbert Cross & Son, 14 Highland Ave., Bala-Cynwyd 45, Pa., or—**Inform-A-Gram No. A37.**

A Faster, Cooler Cut is produced by a new line of cut-off wheels. The B7 bond line of "Aloxite" aluminum oxide resinoid wheels combines the qualities necessary to dry production metal cutoff operations. Three grades are available—"R" for operations requiring minimum burn and burr, "T" for general purpose work where some burn and burring is acceptable, and "V" for rough work. Wheel sizes range from 6" to 20" dia., and 1/16", 3/32", and ⅛" thick. All wheels are available in 24 to 120 grit. They're manufactured by Bonded Abrasives Div'n, The Carborundum Co., Niagara Falls, N. Y. **Circle Inform-A-Gram No. A38.**

A Portable Spring Tester for checking loads and deflections of compression springs has been produced by The Carlson Co., 277 Broadway, New York 7. Useful in factory production lines and receiv-

ing and inspection departments, its capacity is from 1 to 250 lbs with lengths up to 4⅝". An adjustable stop permits production testing up to 800 tests per hr. **Circle No. A39.**

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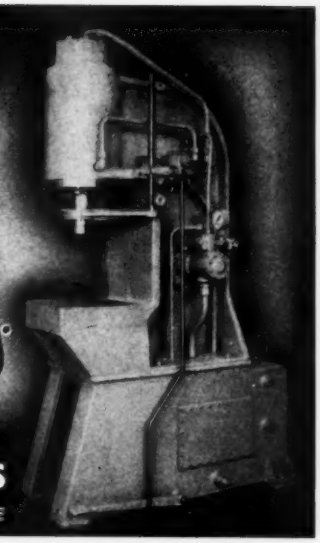
Hydraulic presses made to conform to J.I.C. standards. Pictured at right is 15-ton hydraulic press. Write for Catalog 554.



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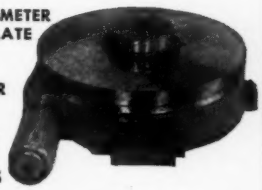

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80 TO 3/32

.0135 TO .0937

- High Micro-Finish for straighter holes. More uniform cutting pressure. Longer drill life.
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- Special sizes to your specifications.

ACME TOOL COMPANY

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CIRCLE INFORM-A-GRAM KEY NO. 2053

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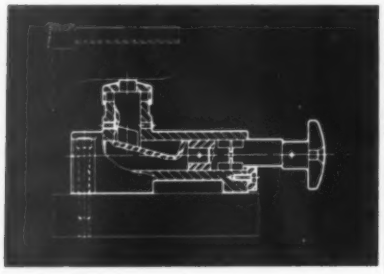
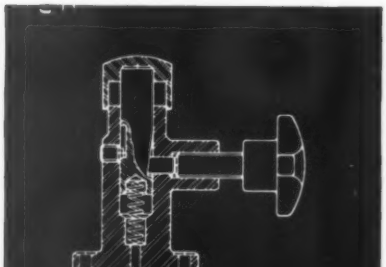
Lodding mass-produced line is as handy as your nearest Lodding distributor —in all industrial centers— to meet your every need.



Lodding Heavy-duty Jack Assembly is the modern way to support work while machining. Makes obsolete makeshifts like screw jacks and shims. Made in three sizes.



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THE STANDARD LINE OF JIG AND FIXTURE COMPONENTS

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6/32, 8/32, 10/32. No Conduction. No Corrosion. Eliminate Insulating Bushings.
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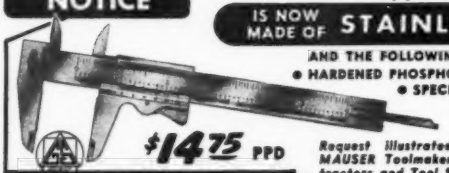
The Genuine MAUSER **VERNIER CALIPER**
IS NOW MADE OF **STAINLESS STEEL** THROUGHOUT
AND THE FOLLOWING IMPROVEMENTS HAVE BEEN ADDED
• HARDENED PHOSPHOR-BRONZE adjustable gib retains accuracy
• SPECIALLY LONG VERNIER to read thousandths
• 3 GRADUATIONS - 1/1000" - 1/128" 1/10 mm in back



$14.75 PPD
Request illustrated folder showing complete line of MAUSER Toolmakers Calipers, Height Gages, Bevel Protractors and Tool Stands.
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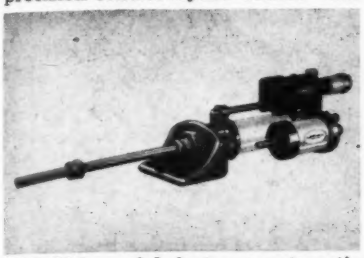
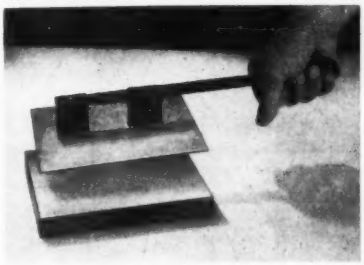


DCP-50A model features automatic flow and thermal compensation. Developed by The Bellows Co., Akron, O., it's used where extreme accuracy of movement is required.
Circle Inform-A-Gram No. A40.

Speed Hand Feeding with a new magnetic hand tool developed by Magnetool. The Lifter and Feeder picks up sheet steel, blanks, or formed parts by means of permanent magnetic gripper and holds them. It's used for sheet steel handling



and feeding, handling hot or cold metals, and separating stacked steel sheets. The tool uses no batteries or electricity and carries an unlimited magnet life guarantee. Magnetool Div'n, Multi-finish Mfg. Co., 26341 W. Eight Mile Rd., Detroit 19, or — **Circle Inform-A-Gram No. A41**

A Solid Carbide Countersinking Cutting Tool has been introduced by Raymac, Div'n of Dexco Corp., 15490 Dale Ave., Detroit 23. Its unique construction eliminates chatter or vibration and insures exact cutting

in one operation. The countersink has an 82° included angle and is available for Nos. 5, 6, 8, and 10 screw sizes. Larger sizes, ¼" to ½", can be ordered. **Circle No. A42.**

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Hardened and Ground High Speed Steel

STANDARD BLANKS: Hardened and centerless ground high speed steel blanks carried in stock for your use. Diameters supplied with tolerance of plus .0002.

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USE FOR: The combination of perfectly hardened and tempered high speed steel produces a tough and hard blank that can be used as PUNCHES, KNOCK-OUT PINS, DOWEL PINS, END-CUTTING TOOLS, GAUGES AND ROLLERS.

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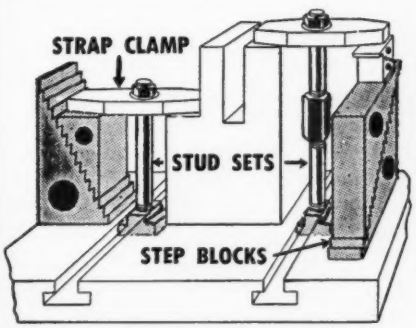

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Stops Losses making Dies and Templates
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- **Practical advantages** of surface roughness specification.

ALSO gives tips on MEASURING surface roughness in the shop—and briefly tells why most plants use the PROFILOMETER for doing this.

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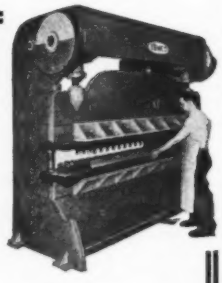

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- *for torque requirements from 10 inch-ounces to 2000 foot-pounds*
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PRECISION WORK AT ANY ANGLE

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Combination Drills with two or more diameters are used on high production jobs to machine holes of various diameter, and angles or radii. Chicago -Latrobe manufactures up to four-dia. "Subland" Drills, depend-

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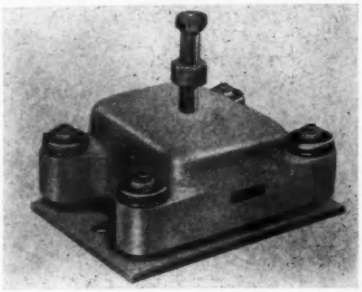
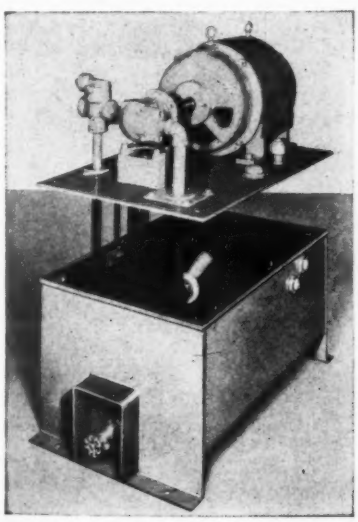
Built-In Adjustable Sway Control Assemblies providing stability without using external snubbing devices, are featured in a new line of heavy duty, general purpose steel spring vibrating mountings. "Finnflex"



Type SB mountings' optimum damping is provided by nylon liners. The line consists of 41 sizes ranging in rated load capacity from 100 to 6500 lbs. T. R. Finn & Co., Inc., Industrial Div'n, Hawthorne, N. J., or **Circle Inform-A-Gram No. A44.**

Hydraulic Power is made available for industrial jobs by the Rosaen line of standard hydraulic power units, in five sizes from ¾ to 20 hp. PT



Power Units have electric motors, pumps, and valves mounted on TK tanks. The Rosaen Co., 24601 Harper Ave., St. Clair Shores, Mich., or **Circle Inform-A-Gram A45.**

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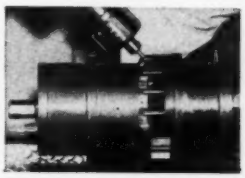

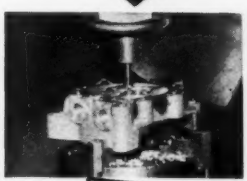

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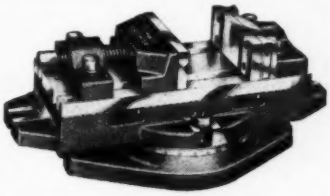

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THE PRODUCTO MACHINE CO.
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MAGNIFIES the "hard to read" vernier scales on calipers and height gages. No more eye strain, guess work or hit or miss setting and reading. **LENS** is finest quality optical glass, specially designed and ground for the purpose with utmost optical skill. 4X magnification shows lines true and correct. In daily use in plants of Westinghouse, General Electric, General Motors, Chrysler, Packard, Ford, Boeing Aircraft, Bendix Aviation and many others engaged in defense work.
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SAVE $10,000.00 in perishable tool inventory with HAYDEN ADJUSTABLE DRILLS

Only two ordinary drills, 1" and 2", needed in stock for hogging out metal. A Hayden Adjustable Drill will then cut the hole to its specified size. Adjustable drills come in two sizes, 1" to 2"; 2" to 4". Blades are high speed steel. Carbide tipped blades at extra cost. **Write for Literature and Price List.**

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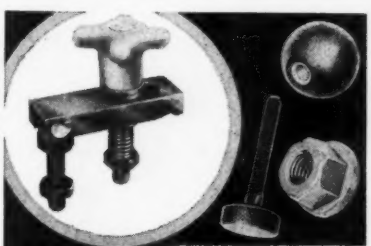

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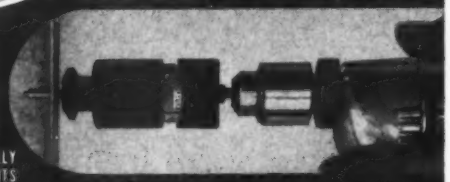
NOW AUTOMATIC Hole DEBURRING

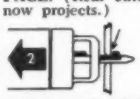


AUTOMATICALLY DEBURRS PARTS LIKE THESE!

with NOBURMATIC TOOL

New Noburmatics deburr and chamfer front and inaccessible back hole faces in ferrous and non-ferrous sheets, plates, extrusions, castings and forgings ***in one automatic operation.*** Used in drill motors or stationary machine tools, Noburmatics produce uniform deburring with high accuracy, increase production line speed. Made in all drill sizes from ⅛" (.125) to F(.256).

Entry Noburmatic enters hole, advances to limit stop, DEBURRS FRONT FACE. (Rear cutter now projects.)



Withdrawal BACK FACE DEBURRED. Cutter automatically retracts. Tool ready for next cycle.

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CIRCLE INFORM-A-GRAM KEY NO. 2101

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On your next electrical control panel application call J. I. C. ELECTRIC CO. We ENGINEER, BUILD, INSTALL, and give IMMEDIATE DELIVERIES.

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CIRCLE INFORM-A-GRAM KEY NO. 2102

MR. PRODUCTION FOREMAN:

YOU, TOO, WILL BE ASKED THIS QUESTION SOONER OR LATER, BETTER CHECK UP BEFORE IT'S TOO LATE!
WE'LL SEND YOU COMPLETE INFORMATION AND PRICES VIA RETURN AIR MAIL!
Phone, wire or write us RIGHT NOW!

Severance TOOL INDUSTRIES INC.
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Representatives and Distributors in Principal Industrial Areas.

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4-POST TABLE WITH DRAWERS

OUTSTANDING DRAFTING FURNITURE AND EQUIPMENT

Channel reinforced covers, enclosed heavy gauge re-inforced corners, gussets on flush base, folding dust covers, all are special features with Mayline metal plan files. Prompt delivery thru your local dealer.

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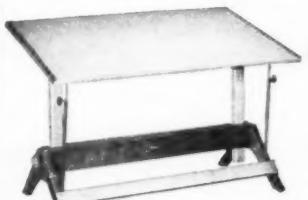

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Symbol of MAYLINE Superiority

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SHEBOYGAN, WISCONSIN

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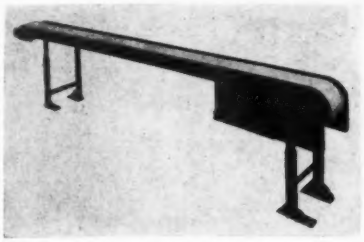
CIRCLE INFORM-A-GRAM KEY NO. 2104

Three Standard High-Lift Die-Handling Units in capacities of 3, 4, and 6,000 lbs are now available. They're part of Automatic Transportation's "Transtacker" line and are designed to handle dies and templates into and out of metal working presses and storage areas. Equipped with "flip over" type die-handling pins, they're produced by Automatic Transportation Co., 149 W. 87th St., Chicago 20. **Circle No. A46.**

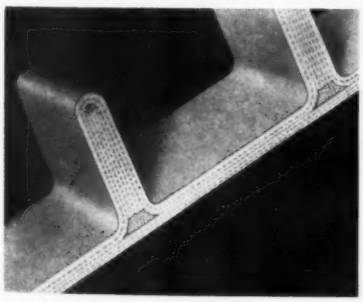
A Horizontal Belt Conveyor, the "Moto-Belt," is the newest addition to New London Engineering's line. It's used for production, assembly, inspection, and packaging operations. The belts are made of cotton, canvas,



rubber, neoprene, plastic, or wire mesh from 2" to 18" wide. Belt speeds can be fixed or variable. New London Engineering Co., 1700 S. Division St., New London, Wis., or—**Circle Inform-A-Gram No. A47.**

An Automatic Feed is featured in the "Airflex" electronic riveter of hollow or solid, small studs and pins of silver, copper, brass, or mild steel. Any shape may be used if the projection is suited to hopper orientation. It combines high frequency blows with spinning to permit a cold-flow rivet upsetting without weakening it. Lemert Engineering Co., Inc., Airflex Div'n, 206 E. Jefferson, Plymouth, Ind. **Circle A48.**

A Cleated Conveyor Belt for incline or decline conveying, features a fabric reinforced cleat with no joints, cracks, or gaps. It can be supplied in rubber, neoprene, or special



compounds for resisting grease, oil, juices, chemicals, etc. Write to A. J. Sparks Belting Co., 867 Grandville Ave., S.W., Grand Rapids, Mich., for more information, or — **Circle Inform-A-Gram No. A49.**

ALINA KNURL CUTTERS

ALINA KNURL CUTTERS actually mill the pattern and produce chips in the process. Alina Knurl Cutters will cut your machining time approx. 30%. They will provide the solution to some of your most complex knurling problems.

DESIGNED TO

- knurl all machineable materials
- knurl thin-walled parts without internal support
- maintain fine diametral limits
- knurl diameters from 1/16" to 10 ft.

Models available for all types of machines. For detailed information and prices, write to

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Any decimal diameter to ⅝"—in any length.
Mirror finish surface to gage tolerance.
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P O B 328, UNION, N. J.
Factory: Springfield, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 2112

LUCAS TOTE PANS

HELP SOLVE PRODUCTION PROBLEMS!

Lucas Tote Pans are built for long wear and ease of handling. Designed for every shop use—storing materials, holding parts for convenient handling by machine operators and at assembly lines, Lucas Tote Pans are available in nesting type, stacking type, straight side and assembly or bench pans. Lengths from 10" to 32", widths from 5" to 23" in standard sizes. Other sizes made to your specifications.

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new tapping unit produces

GAUGE PERFECT PARTS always!

10,000, 100,000 or 1,000,000 parts and more—all precision tapped—without variation, without rejects, without thread distortion! That's the production record of this remarkable Procunier Lead Screw Tapping Unit! It is truly the most outstanding tapping development in years! It's easy to operate too! Gentle finger tip pressure actuates the head — eliminates operating fatigue. Check these facts:

Trigger arms travels only ⅜"; tap idles in neutral, reverses at twice forward; friction clutch prevents tap breakage; positive depth stop holds uniform depth; produces gauge fits in any pitch from 20 to 80; hardened and ground lead screw assembly replaced in seconds for varying pitches; tap capacity 0" to ¼" in soft material —0" to ⅛" in steel; unique wiper oils and cleans lead screw while in operation; lead screw travel 1-⅛"; can be air operated.

Send for FREE brochure giving more complete details.

Exclusive "Tru-Grip" Tap Holder is lighter, smaller in diameter

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The Quick, Easy, Handy Way to TAP BY HAND

. . . Adapts for LATHE USE

THE DAHLSTROM TAP GUIDE virtually eliminates tap breakage—and saves those costly hours spent prying broken taps out of dies. Anyone can use it. Just a few turns of the spindle and the job is done.

Winds through continuously, with no backoff. Work is always dependably straight and square. Fasten it to a post or set it on top of a big job. This handy tapper comes equipped with 9 adapters, 8-32 to ¾" but taps are not furnished. Spindle can be pulled out and used in a lathe, or used as tap extension for hard-to-get-at-places. 13" x 8" x 14", wt. 32 lbs. $59.50 F.O.B. factory.

Also Makers of Dahlstrom Autostrop and Tap Chuck

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Dahlstrom **TAP GUIDE** — **59.50** F. O. B. FACTORY

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The Most significant advance in a quarter Century of HEIGHT GAGE DESIGN

EASY READING 2-1/2" LONG VERNIER
RAPID QUICK ADJUSTMENT
TOP VIEW
TRIANGULAR SCALE BEAM for Superior Strength and Rigidity, preventing sway and vibration.
FINE ADJUSTMENT THRU SCREW ON BASE
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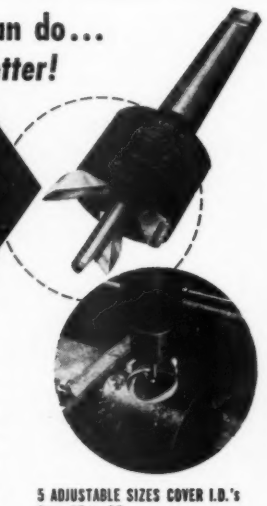
CIRCLE INFORM-A-GRAM KEY NO. 2122

Does jobs no drill can do... Does many jobs *better!*

Clark "HOLE-MAKER"



Produces round, true holes in CASTINGS, FORGINGS, BOILER PLATE, THIN SHEET STOCK, PIPE, TUBING, ETC.; Drills CROWNED, CYLINDRICAL, FLAT OR WEBBED SURFACES!

No triangular shaped holes, no grabbing on break-throughs, no "walking" on starts with the Clark "HOLE-MAKER"! Produces full-gauge holes from start to finish. Removable pilot guides HOLE-MAKER straight and true even on intermittent cuts. Will also use pilot drill.

Ideal production tool on TURRET LATHES, CHUCKING MACHINES, RADIAL DRILLS, DRILL PRESSES, PORTABLE ELECTRIC and PNEUMATIC DRILLS. Excellent for rough boring, finishing and trepanning. Cuts all ferrous and non-ferrous metals and other materials. Saves money, replaces large drill inventory... Bores castings, forgings, etc. 3 to 10 times faster than single pointing!

5 ADJUSTABLE SIZES COVER I.D.'s from 1" to 6"

Specify straight shank or MT 2, 3, 4. Other tapers on order.

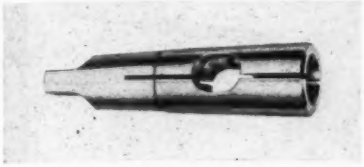
MODEL	CAPACITY
102	1"—2"
203	2"—3"
304	3"—4"
405	4"—5"
506	5"—6"

When ordering, specify material to be cut.

ROBERT H. CLARK COMPANY
9330 Santa Monica Blvd., Beverly Hills, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 2124

Accurate, Trouble-Free Center Drilling Operations in centering, milling, and automatic screw machines; drill presses; boring mills; and lathes are possible with a new center drill driver. Style "B" produced by Scully-Jones, will drive combined center drills and counter-

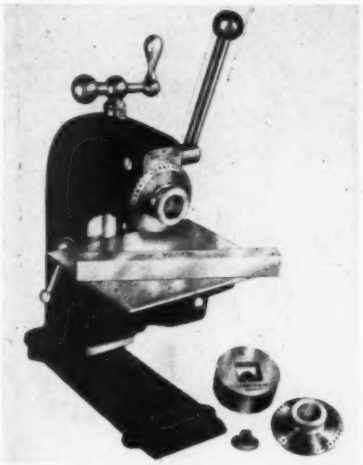


sinks of regular or bell type. An offset splined section furnishes a positive drive in the flutes of the drill and protects the cutting edges. Information on this precision holding tool may be obtained from Scully-Jones and Co., 1901 S. Rockwell St., Chicago 8, or—**Circle No. A50.**

A New Improved Vernier Caliper has been announced by Alina. The "Etalon" No. 17 Universal Vernier Caliper is made of hardened stainless steel with finely machine-divided

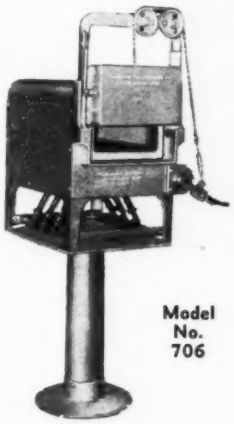
graduations in English or English and Metric. Alina Corp., 401 Broadway, New York, will supply details on this precision instrument, or — **Circle Inform-A-Gram No. A51.**

A Tool Room Indenter stamps identification data on die blocks, die components, metal plates, tools, gauges, jigs, fixtures, etc. This com-



pact bench type machine will take parts from 1/32" to 3" thick and the throat permits stamping 4⅜" from the top edge of the part. Geo. T. Schmidt, Inc., 4112 Belle Plaine Ave., Chicago 13, or—**Circle No. A52.**

MORE FLEXIBILITY IN YOUR SHOP



Model No. 706

Harden, heat treat, temper and anneal with one furnace . . . the Johnson No. 706.

Another in the Johnson line of dependable gas equipment has won its place in both large and small shops and plants. Operators like its easy adaptability. Six Johnson Direct Jet Bunsen Burners with individual shut off valves and pilot lights provide steady, easily controlled heat from 300 to 1850° F. Semi-muffled type with burners operating below Carbofrax hearth. Firebox: 7" x 13" x 16½". Also available bench style. Write for complete and factual information.

A smaller version of this highly flexible furnace is the No. 654. Four burners deliver 300 to 1800°F. Firebox: 5" x 7¾" x 13½". Available as pedestal or bench style.

JOHNSON GAS APPLIANCE CO.
575 E Avenue, N. W., • Cedar Rapids, Iowa

Johnson No. 706 Pedestal Style	$300.00
Bench Style	$275.00
Johnson No. 654 Pedestal Style	$163.00
Bench Style	$138.00

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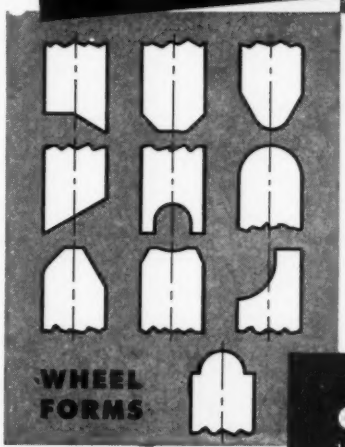
JOHNSON
INDUSTRIAL GAS EQUIPMENT

Furnaces • Burners • Torches • Valves • Mixers • Blowers

CIRCLE INFORM-A-GRAM KEY NO. 2131

Precision Dress Grinding Wheels to ANY FORM IN ¼ THE USUAL TIME



The Perfex TANGI-MATIC Dresser is a self-contained precision tool built by an organization of master gagemakers for high precision work.

Any shop man who can read a "mike" can operate the dresser the first time. No Jo Blocks, no height gages or other auxiliary tools needed. All radii and angles are read directly.

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FOR DOUBLE DUTY

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Weldon leadership in the cutting tool field has been achieved by many original features which contribute to faster, better performance and longer tool life.

Weldon distributors throughout U.S.A. and Canada carry complete stocks to serve you.

THE WELDON TOOL COMPANY

3000 WOODHILL ROAD • • • CLEVELAND 4, OHIO

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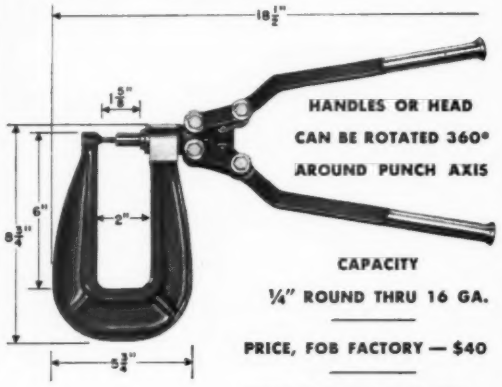
POWERFUL, TOGGLE-ACTION

DEEP-THROAT PUNCH



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CAPACITY

¼" ROUND THRU 16 GA.

PRICE, FOB FACTORY — $40

EXTRA PUNCHES AND DIES

1/16" TO 9/32" BY 1/64" — 50c each

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No. 15 PUNCH

WHITNEY METAL TOOL COMPANY

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with *Horberg*

PRECISION PIN GAGES

EXCLUSIVE CONCENTRIC ENTRY TAPER for faster, more definite inspection of holes, for greater ease in centering. Gage sets supplied for all common drill sizes.

TOLERANCE +0.0001" −0.0000"

SETS: Two gages in each size, with convenient stand.

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Affiliate of Horberg Grinding Machinery Co., 36 Stanley St., Bristol, Conn.

Please send Horberg Pin Gage Catalog to

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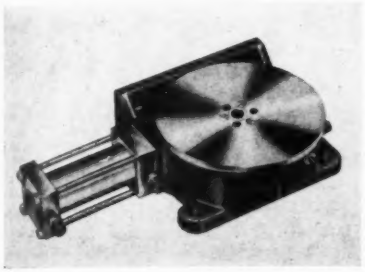
(Please attach to company letterhead)

CIRCLE INFORM-A-GRAM KEY NO. 2143

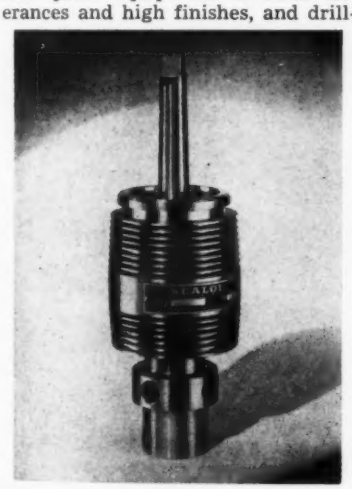
Two New Indexing Dial Feed Tables have been introduced by A. K. Allen Co., 57 Meserole Ave., Brooklyn 22. Air-operated Models 725-EA and 725-EB are capable of indexing on 24 indexes at 300 cycles/min., with a 40-lb load. Equipped with a 7¼" dia. plate, they're de-



signed for use in areas where the space is limited. They can be set for 4,6,8,12, or 24 indexes/rev. Accuracy is ± 0.001 at the periphery of the top plate. Model 725-EB has control valves for automatic operation, and Model 725-EA has no valves. **Inform-A-Gram No. A53.**

Work 10 Times Longer between sharpenings when using a new type flat hand scraper with removable carbide-tipped blades. It's possible to change scraper blades in less than a minute. The tool is used for rough and finish surface scraping, and easily cuts through hard alloy iron and bronze castings. It's manufactured by Peerless Tool, Inc., N. Attleboro, Mass. **Circle No. A54.**

Using New High Pressure Coolant Transfers for gun drilling, holes can be drilled with conventional drill press equipment to close tolerances and high finishes, and drill-



ing time shortened. Coolant is introduced through a hollow drill under pressures to 1000 psi and at speeds to 10,000 rpm. Bulletin NL-55 from Sealol Corp., Warwick Industrial Park, Providence 5, R. I., gives complete information on Type DA adaptor units, or—**Circle A55.**

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Lacey Die-Set Machine

Here's a truly "one man" press. It operates with one hand. Handy for tool and press rooms, it permits the diemaker to complete a die-set at his bench . . . saves toolroom and handling costs. Ask today for full details.

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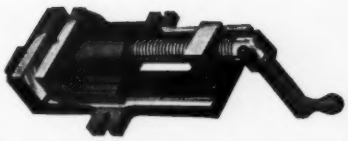

YOST DRILL PRESS VISE

• This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

OFFERED IN TWO SIZES

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	4	12½
2D	5	5½	23

Do you need a vise of ANY type?
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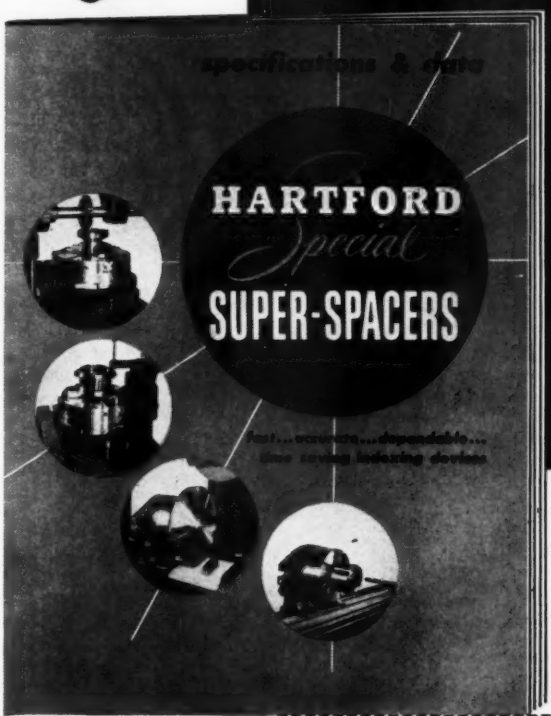
CIRCLE INFORM-A-GRAM KEY NO. 2152

FREE

the answer to
CIRCULAR INDEXING PROBLEMS . . .



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Available now in 148 low-cost standard sizes to meet your exact requirements!

"*Versatile!*" Yes, that's one word for Ace Drill Blanks. And "*economical*" is another. Because they're "all-purpose" tools that you can readily use in countless different ways. Properly heat-treated to uniform hardness, then precision ground to size, they're ideal as punches, dowels, knock-out pins, and gages. Perfect for rollers, too, on high temperature applications. And you'll find they can be quickly, easily, economically adapted to a wide range of end-cutting tool applications to save time, step up production, and reduce costs! Call your local distributor . . . or send for complete information today!

ACE DRILL CORPORATION
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Gentlemen: Please send me your Catalog No. 52-C containing complete information on ACE "Ground-from-the-Solid" Drills and hardened H.S.S. drill blanks.

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ACE DRILL
ADRIAN, MICHIGAN

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

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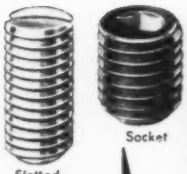

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* Pat. No. 2,638,945, Others Pending

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10-62P

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LITTELL

mobile, self-powered feeding and straightening machine

Used with any hand-fed press or square shear, this machine instantly provides *automatic* straightening and feeding. These Littell machines operate independently of using equipment, supply their own smooth, hydraulic power. There is only a simple electrical connection between units, permitting easy reconversion to hand feeding. The machines feed up to 19" lengths at 40 strokes per minute and handle any coil stock up to .125" thick and 24½" wide. Pacemaker control automatically synchronizes feed and press action. *Write for Catalog 6-U, giving full details.*

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REELS • AIR BLAST VALVES
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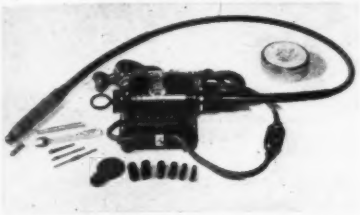
CIRCLE INFORM-A-GRAM KEY NO. 2163

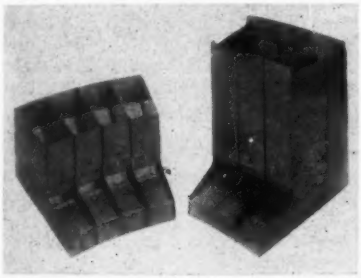
Increase the Efficiency of grinding, cutting, burring, trimming, routing, filing, polishing operations by using the Leigh LG-3 Basic Grinder. This flexible shaft grinder has a 20,000-rpm motor, and rheostat control to



provide correct operating speeds for even the smallest tools. Spring Specialty Co., 23 N. 5th Ave., Maywood, Ill., has full details on Model LG-3, or—**Circle Inform-A-Gram No. A56.**

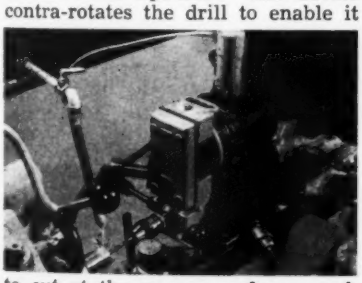
A Low Weight Casting Resin has a specific gravity when fully cured of 0.90. "Stycast 1090", an epoxide base material, has a wide temperature range from —100°F to —400°F. It's useful in aircraft and other equipment where weight is an important factor. Emerson & Cuming, Inc., 869 Washington St., Canton, Mass. **Inform-A-Gram No. A57.**

Faster, Smoother Hand Assembly Operations are made possible by "Speedbin" kits. Workpieces are gravity fed with rate of flow controlled by an adjustable shutter. The



kits with interchangeable parts come in size A, 4½" high and size B, 9" high. Speedassembly Equipment Co., 26 Court St., Brooklyn 1, N. Y., has full details, or—**Circle No. A58.**

Small Hole Drilling can be done economically and quickly on a turret lathe by using the new Ward-Riddle Drill Speeder. The device contra-rotates the drill to enable it



to cut at the proper surface speed. Drill capacity ranges up to 13/16" in tool steel. The Ward-Riddle Co., Ravenna, O., has just introduced this drill speeder. **Circle No. A59.**

Here's **FREE** help in solving thousands of difficult

PRODUCTION AND INSPECTION PROBLEMS

24 pages packed with guidance on the selection and specific on-the-job applications of all types of Industrial Magnifiers.

This practical booklet answers all your questions: "Just what is a magnifier?", "Why so many different KINDS of magnifiers?", "What is meant by a 'corrected' lens?" It also discusses correct working distances, magnification and field of view, magnifiers as precision instruments, and how to hold a magnifier. All this—PLUS condensed catalog listings giving specifications and suggested uses of available types of magnifiers which will cut rejects, save money and speed production!

Send for your FREE copy today! Bausch & Lomb Optical Co., 50446 Bausch St., Rochester 2, N. Y.

BAUSCH & LOMB

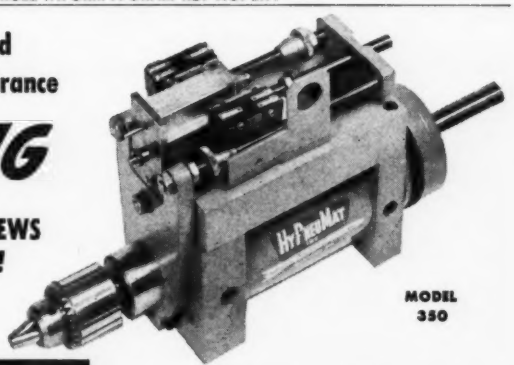
Industrial Magnifiers

CIRCLE INFORM-A-GRAM KEY NO. 2171

NOW High Speed Close Tolerance

TAPPING

WITHOUT LEAD SCREWS OR TAPPING HEAD!!



MODEL 350

HYPNEUMAT
AUTOMATIC DRILLING AND TAPPING UNITS!

HYPNEUMAT Units, precision made with almost zero reciprocating friction, permit a floating cushion action to the spindle, allowing the tap to automatically feed itself, subject to no force other than the torque. With the elimination of all axial friction, the tap may be rotated at high speeds, usually the same speed the hole is drilled, and with the assurance that every thread is perfectly produced.

CAPACITY: 3½" STROKE
⅜" Drilling in Steel — ⅜" Tapping

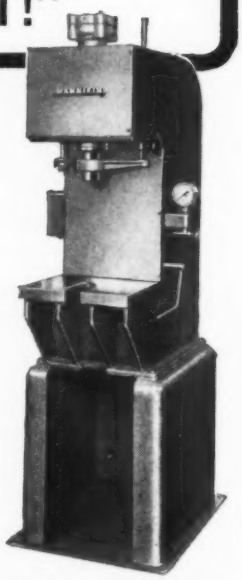
- SEALED UNIT Construction permits mounting in any position with pulley or direct motor drive.
- AIR or HYDRAULIC Control of speedy approach, stroke and rapid return.
- ENCLOSED ELECTRICAL SWITCH for remote electrical operation.
- QUILL CLAMP EXTENSION permits extremely close radial grouping.
- EASILY INTERLOCKED with indexing tables, automatic work feeders and fixtures.
- HYDRA-BRAKE prevents drill dive at break through point.

HYPNEUMAT, INC.
647 W. Virginia St. Milwaukee 4, Wis.

FREE Send for our free catalog containing detailed information of HYPNEUMAT Automatic Drilling and Tapping Units and their adaption to modern high speed production equipment.

CIRCLE INFORM-A-GRAM KEY NO. 2172

"BEST $1286 WE EVER SPENT!"



That's the price of this 5-Ton HANNIFIN Press*

A lot of production men have made such comments about this versatile little hydraulic press.

They like the way you can adjust it to the exact force you need for each job, all the way from 1 ton to 5 tons. The backstroke is adjustable, too, so the ram just clears the work on any job. Fast-acting controls. Prompt delivery from stock.

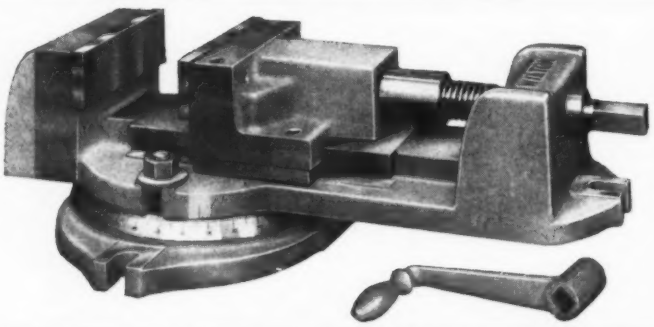
WRITE. Complete information and prices on the Hannifin line of 1- to 10-ton Hydraulic Presses will be sent on request.

*Price complete with motor and starter F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

HANNIFIN

HANNIFIN CORPORATION, 563 S. WOLF ROAD, DES PLAINES, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 2181



69% MORE CAPACITY AT NO EXTRA COST!

Wilton's new RX-60 has a maximum 6¼" jaw opening, self-cleaning flat bed design, and unconditional 5 year guarantee — yet costs no more than ordinary 6" machine vises! Order Wilton's RX-60 NOW, to improve and simplify production at no increase in tooling cost! There is a Wilton product for every clamping problem.

Attach this ad to your letterhead for a FREE Demonstration or Catalog

"The Finest Name In Vises" TP-10

WILTON TOOL MFG. CO., INC.

9525 Irving Park Road, P. O. Box 56, Schiller Park, Illinois

wilton tool canada ltd., guelph, ontario, canada

CIRCLE INFORM-A-GRAM KEY NO. 2182

SERVICE AWARD GIVEN MOTCH & MERRYWEATHER

* * *

MOTCH & MERRYWEATHER'S

D. M. PATTISON
Director of Marketing

. . . and . . .

A. J. SNYDER
Manager, Cutting Tool Distributor Division

When the National Industrial Distributors Association recently celebrated its 50th anniversary, it presented to the Machine Tool Distributor Division of Motch & Merryweather Machinery Co., Cleveland, a certificate as a "token of recognition and appreciation for long and valuable service."

The name of Motch & Merryweather has been associated with leaders in the machine tool field since 1904. The company has continually strived to present better products, technology and methods to industry. Result has been steady growth in the company's four territories: Cleveland, Detroit, Pittsburgh and Cincinnati-Dayton.

In 1948, the company formed a Cutting Tool Distributor Division to augment and supplement machine tools sales. This expansion enabled the firm to serve and counsel customers in both machine and cutting tools.

When started, the Cutting Tool Distributor Division had a staff of four persons and represented six lines. At present the division employs 29 persons and represents 26 lines. This growth in so short time reflects, company officials feel, the confidence that the metal-working industry has in Motch & Merryweather.

Because of the extensiveness of the metal-working market, widely diversified lines were chosen that would cover almost any given tool requirement of modern industry. The firm carries in stock a wide line

. . . *Continued on page 221*

FIRST TRULY PORTABLE 200 AMP. ARC WELDER

Weighs only 65 lbs.; carry it to the job! Using the first TOROIDAL transformer!

BREN-WELD
MODEL 200 AW

OBSOLETES ALL OTHER WELDERS OF COMPARABLE RATING!

- 200 Amp.—At 50% Duty Cycle
- 250 Amp.—Reduced Duty Cycle
- 110/220 Volts A.C., 50/60 Cycles
- *Also Available For 220/440 Volts*
- Simple To Use—Fully Guaranteed

Employing the first toroidal transformer ever used in arc welders, the portable Bren-Weld does the work of conventional welders 4 to 5 times its size and weight. Eliminates the necessity to transport bulky equipment or heavy parts to be welded. *Now you can carry Bren-Weld to the job!*

Bren-Weld handles electrodes from 3/64" through 5/32"; it has adjustable arc voltage for various arc characteristics.

Because it is so flexible in operation and application, Bren-Weld is ideal for plant production and maintenance, for construction work, for railroads, on the farm and in home workshop.

11" x 12" x 7½"
LIST PRICE $169.50
(F.O.B., L. I. CITY, N. Y.)
Lowest Price On Market For Comparable Ampere Rating

FREE!
For details of free trial offer and folder see your dealer or write directly.

A KASSON PRODUCT

24 HOUR DELIVERY FROM STOCK!

Manufactured by BRENNEN, BUCCI & WEBER, INC. New York City

Sales Division
KASSON DIE & MOTOR CORPORATION
INTEGRITY SINCE 1919
32-14 Northern Boulevard, L. I. City I, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 2191

Announcing "ADJUSTABLE-STROKE" MIDGET Air-Clamp* CYLINDERS

*TRADE MARK

Actual overall length horizontal models: 3½", 5", 6".

New! —SAVE TIME!
These 6 brand-new Midget Air Clamp cylinders with adjustable strokes variable from ½" to 3" can be used where longer strokes are needed *and* stroke can be "tuned" to exact length wanted even *after* setup is made!

New! —SAVE AIR!
You can save air in large fixtures where dozens or hundreds of "Midgets" are used by adjusting stroke with special spanner wrench furnished with cylinder.

New! —SAVE SPACE & MONEY!
The "nose" on each "Midget" also telescopes into barrel reducing stroke and overall length to save space in cramped quarters! Each Mead "Midget" is guaranteed to give you millions of trouble-free cycles—to be a better value, dollar for dollar, than any comparable cylinder. Priced so low you can almost forget it!

Actual overall height vertical models: 3 9/32", 4 25/32", 5 25/32"

"MORE per hour with Mead Air Power"

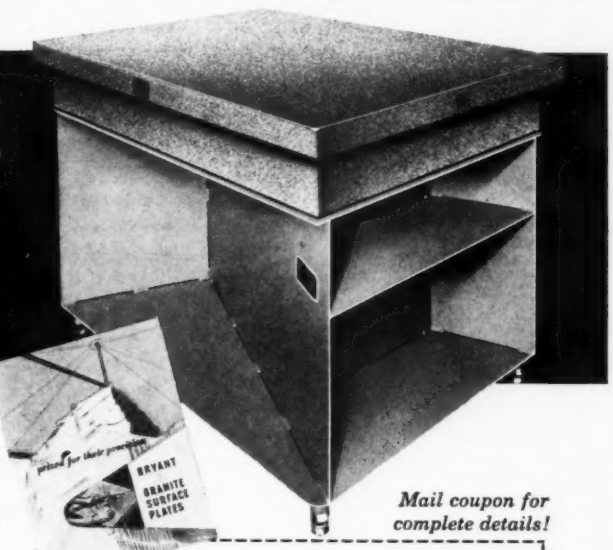
Write Factory or Nearest Mead Man For Bulletin HA-105 (See Index Thomas Register for address, phone).

PATHFINDER IN AIR POWER AUTOMATION

MEAD
SPECIALTIES COMPANY
4114 N. Knox Ave., DEPT. HA-105
CHICAGO 41, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 2192

BRYANT GRANITE ROCK OF AGES SURFACE PLATES



unexcelled for wear resistance

Bryant Granite Surface Plates are finished on the "head" of the grain, a patented process. This feature ensures a long wearing surface of uniform density and durability.

Low in cost, Bryant plates are made from selected fine grain black and white granite and are ideally suited for inspection, layout and assembly work. Convenient stands featuring 3-point mounting for plates are available.

doubly guaranteed

Bryant, maker of precision machine tools and gaging equipment, unconditionally guarantees every plate for specified flatness.

Rock of Ages, the world-famous quarry, guarantees the granite itself, for perfect grain, close-knit composition and flawless texture.

Mail coupon for complete details!

BRYANT GAGE & SPINDLE DIVISION
Box 620 H, Springfield, Vermont

Gentlemen:

Please send me your free folder describing Bryant Granite Surface Plates.

Name_____ Title _____

Company_____

Street_____

City_____ Zone____ State_____

BRYANT GAGE & SPINDLE DIVISION • Springfield, Vermont, U. S. A.

Internal Grinders · Boring Machines · Internal & External Thread Gages
Groove Gages · Granite Surface Plates
DIVISION OF BRYANT CHUCKING GRINDER CO.

CIRCLE INFORM-A-GRAM KEY NO. 2193

Tomco

HAND WHEELS
HAND KNOBS
MACHINE HANDLES
HANDLES
BALL HANDLES
SPECIALTIES

Specify Tomco for long lasting dependability

A complete line of high grade hand knobs, handles, and hand wheels is available from Tomco. Immediate shipments are made from stock of standard items. Specialty items are made to your specifications.

For original equipment or replacement parts look to Tomco for quality and service.

Write for literature

Tomco PRODUCTS CO.
1623 DOUGLAS AVE.
RACINE, WISCONSIN

Blank or Machined—from stock

CIRCLE INFORM-A-GRAM KEY NO. 2201

WALLS TU-WAY BELT SANDER

USE IT EITHER WAY

Full 1/3 h.p. G. E. Motor

VERTICAL

At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little.

complete with cord, plug, switch ready to use **$89.95**

Illustrated Literature on Request

A few desirable distributor territories still available.

WALLS SALES CORPORATION
333 Nassau Avenue Brooklyn 22, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 2202

Smoother Production! Higher Output! Lower Costs!

RICE-MILWAUKEE

DIE FILERS . . . for straight-line sharp corner filing, sawing and lapping.

This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.

PROFILE GRINDERS

. . . for high speed Precision Grinding of Curved and Irregular Contours.

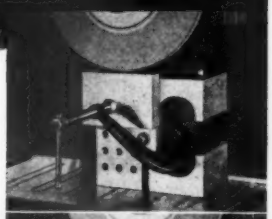
Standard features include 20,000 or 30,000 R.P.M., or a combination of these spindle speeds, ½ H.P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser.

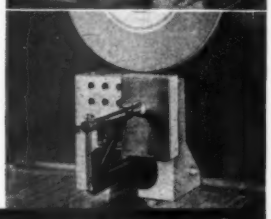
Write for Illustrated Bulletins and Prices

RICE PUMP & MACHINE COMPANY
228 PARK AVENUE BELGIUM WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 2203

NEW **Federal Square Master ANGLE PLATE**





Will Grind A Work Piece Square The Easy Way Without Skilled Help

Designed for grinding a work piece to exact squareness, whether it be a component of a jig, fixture, gauge, or die; eliminating an indicator, precision square, surface plate, and use of top skilled help on routine jobs. Can also be used on layout work and inspection. This precision tool is built of high grade steel, stabilized, hardened and ground. ALL WORKING SURFACES ARE GUARANTEED TO BE SQUARE within two-tenths of a thousandth . . . (.0002). Write for complete literature describing other outstanding features.

Note adjustable set edge and recess for C-clamp. ➔

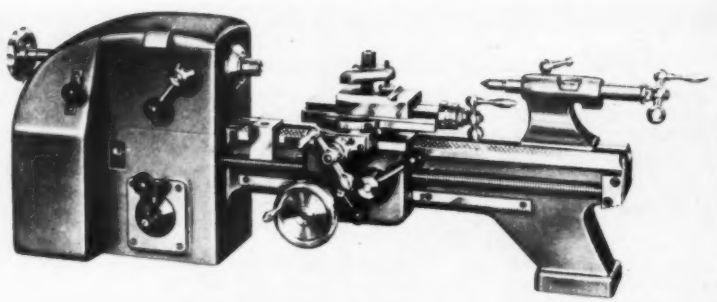
FEDERAL MACHINE TOOL COMPANY, EMMETT STREET, BRISTOL, CONNECTICUT

CIRCLE INFORM-A-GRAM KEY NO. 2204

LORCH Small Precision Lathes

• WATCHMAKING • INSTRUMENT • OPTICAL

World famous for Precision, Economy, Quality



An elaborate assortment of lathes for many purposes. For single parts as well as production. Available with large assortment of accessories such as turrets, thread cutting equipment, multiple tool slides, milling attachments, etc.

Tolerance chart will be supplied with literature.

Sole Agents: **KARL A. NEISE,** 404 Fourth Ave., N. Y. 16, N. Y., Dept. TP

CIRCLE INFORM-A-GRAM KEY NO. 2205

. . . Service Awards, from page 218

of products, ranging from giant surface plates to extremely small taps, drills and engravers' cutters.

The firm keeps on call at all times a staff of experienced sales engineers to assist the buyer in his choice of equipment and material.

The organization continuously looks for better products, methods and services. A step in this direction was made when the firm of Anton Smit and Co., New York, whose complete line of diamond tools and wheels is represented by the Cutting Tool Distributor Division, installed a complete shop at Motch & Merryweather's Euclid, Ohio, plant to repair and service diamond tools.

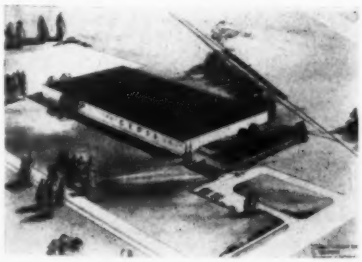
Also, facilities have been set up in the Detroit office for the sharpening and for small repairs of circular saw blades. The intent is to furnish the customers with on-the-spot repairs and/or service in any of the main offices throughout the Motch & Merryweather territory.

New Detroit Plant Will Resist Atomic Radiation

One of the first plants in the Detroit area that will resist atomic radiation is being constructed for Cross Company, builder of automation machinery and special machine tools. The four-million-dollar factory and office building will double production capacity.

The plant is to be located on a 65-acre plot on 14 Mile Rd. and Grosbeck Hwy., 16 miles from downtown Detroit. Operations will be transferred there in the summer of 1956.

The company recently produced an automated assembly machine for V-8 engines. This is the first time automation has been applied to such operations.



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from blueprint to auto show in 56 days!

The HYDROCAL working model of this plastic sports car was completed in four weeks, compared to an estimated 16 to 24 weeks for a wood-carved model. About 1/5th the time!

A dramatic demonstration of the speed, accuracy, and adaptability of HYDROCAL gypsum cements—advantages ready to serve *your* needs for low-cost tooling. Learn how from your U.S.G. Representative, or mail the coupon today.

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☐ Please send me your FREE manual on Industrial Tooling with HYDROCAL.
☐ Put me on the mailing list for THE HYDROCAL CRAFTSMAN.
☐ Arrange to have your "Tooling For Plastics" film shown at our plant.

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CIRCLE INFORM-A-GRAM KEY NO. 2211

do your
Ductility Te
quick & easy

The turning of a single hydraulic control knob clamps the specimen, tests it, then releases it The test is made in plain view, and the maximum pressure indicators show the result until reset. This highly sensitive sheet metal tester will take up to 3/16" thick specimens and exert up to 30,000 pounds pressure, at any desired rate of speed. Hydraulic mechanism is all neatly enclosed. Write for catalog sheet and prices.

DETROIT TESTING MACHINE COMPANY

9386 *Grinnell Ave., Detroit 13, Mich.*

CIRCLE INFORM-A-GRAM KEY NO. 2212

. . . Heavy Lathe, from page 187

and 28″ to 58″ in length, were:

1. Bulky size of the workpiece,
2. Heavy stock removal,
3. Excessive extension of the boring bar.

Production under the old method amounted to only one casting per shift.

Shop engineers at the Byron Jackson Co. converted the Axleson lathe to a special purpose horizontal boring mill by removing the cross slide and mounting to the carriage a rugged saddle fixture which featured changeable shoes for accurate and fast setup for various size castings. A hydraulically-controlled unit, attached to the end of the converted machine, actuated a slide support for the extended end of the boring bar—retractable for loading and unloading castings.

Then a two-piece boring bar was bolted directly to the spindle nose. The boring bar has three movable cutter heads for facing to different shoulder dimensions. Counterbores in each cutter head, Figure 2, locate four circular tool holders and milled key slots back up the tools during the rough boring and facing cuts.

Fig. 1. This 10-year-old Axelson heavy duty lathe was converted into a special purpose horizontal boring mill for boring large cast steel drill hook housings.

Tool holders are designed for rapid changing of pre-set Kennametal brazed tools, (Style AL and BL, Grade K2S), and can be changed quickly by removing a ¾″ nut securing them to the cutter head. Because of the high number of sand inclusions in the castings, tools are changed after each cut to insure free cutting and true bores.

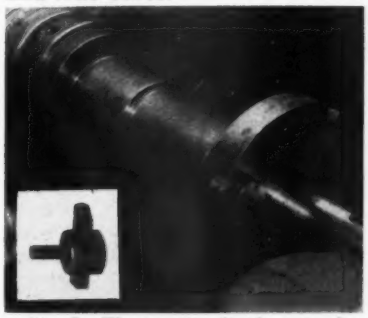


Fig. 2. Three cutter heads, one of which is shown set up on the boring bar, are used in boring and facing to three different dimensions. Each cutter head is counterbored for locating four circular tool holders such as shown in the insert.

The housings are rough and finish bored at three stations simultaneously and then faced and counterbored in 3½ hrs as compared to the old time of 8 hrs. In hook housing operations, close concentricity is a vital factor in the bores and counterbores.

In boring and counterboring the three concentric diameters, the feeds per tool were 0.016″ for roughing and 0.019″ for finishing. SFM was 180 and the depth of cut ¼″ to ⅝″ in the roughing operation, while SFM and depth of cut for finishing were 670 and ⅛″ respectively.

PRECISION

Machine Tool Attachments

with endless versatile variations

TRAVERSE SLIDES FEEDS TABLES
SPINDLES—MOTORIZED OR BELT DRIVE
FOR WORK HEAD OR GRINDING WHEEL

DO IT YOURSELF!

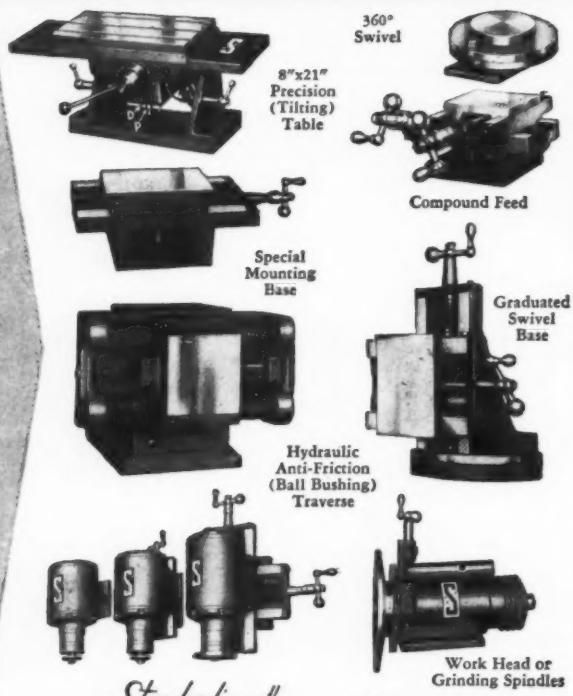
Select a STANDARD Precision Spindle and/or Work Head . . .

Assemble with STANDARD Feeds or Traverse . . .

To convert your old machine tool . . .

To design your own assembly or machine tool . . .

To incorporate in a special machine you wish STANDARD to build for you



Standardize with STANDARD

Catalog on Request

the STANDARD electrical tool co.

MACHINE TOOLS

MT. HOPE & SIXTH STS. • CINCINNATI 4 • OHIO

CIRCLE INFORM-A-GRAM KEY NO. 2221

LOADING DEVICE BOOSTS BROACHED RING GEAR OUTPUT

Quite often it is possible to adapt a standard broaching machine for high rates of production without requiring the extensive modifications that would accompany a complete changeover to automatic production. Engineers at Colonial Broach & Machine Company, Box 37 — Harper Station, Detroit 13, Michigan, recently proved this point by adding a simple loading and unloading device to a standard Colonial RD 15-24 pulldown machine used to broach inside diameters of automobile differential ring gear blanks.

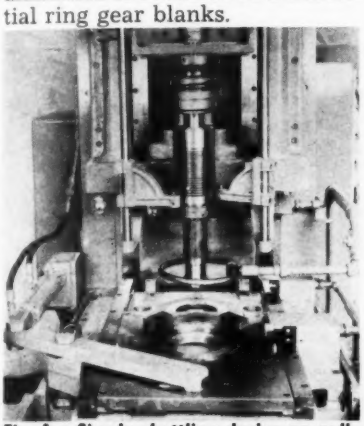


Fig. 1. Simple shuttling device on pull-down broaching machine built by Colonial Broach & Machine Company permits output of 300 differential ring gear blanks per hour. Parts are loaded in this position, and fixture then shuttles in for broaching of accurate internal diameter.

Production at the rate of 300 gear blanks per hour is achieved by adding a shuttling loading and unloading device to this standard 15-ton, 24" stroke machine without entailing any changes in basic design. The operation consists of broaching an accurate internal diameter for location in the gear cutting operation that follows.

A hydraulically-driven, shuttle-type loading fixture was devised and mounted on the work holding platen. Being a pull-down broaching operation, no auxiliary part-holding clamps were necessary. The shuttling fixture only locates the part with respect to the broach. Machine and fixture cycle are hydraulically and electrically interlocked for automatic operation.

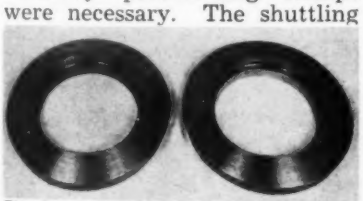


Fig. 2. At left is part before broaching, at right after broaching on Colonial RD 15-24, pull-down machine. Entire cycle takes only 12 seconds.

A pull-down machine was chosen to produce the accurate internally broached parts, with gravity coolant flow keeping the work area free of chips. Performance and accuracy are thereby improved.

Operating cycle for this operation consists of: (1) loading the part in the fixture in the retracted position; (2) energizing the cycle and moving the loaded fixture into broaching position; (3) starting broach downward stroke, engaging work-stroke puller, disengaging from automatic broach return puller and making the cutting stroke; (4) shuttling the fixture into unloading and loading position as broach is returned. Entire cycle, including manual loading, unloading, requires only 12 seconds.

O-O-O-OH! WHAT YOU MISSED . . .
if you didn't get to see these
POPE PRECISION PRODUCTS
at the Machine Tool Show!

EXHIBIT A
The NEW POPE
SUPER-PRECISION
BORING MACHINE
that bores holes round within millionths of an inch—table actuation all electrically controlled — feed and traverse rates infinitely variable — automatic cycle, including loading if desired — angled table and bridge for extreme ease of loading and unloading.

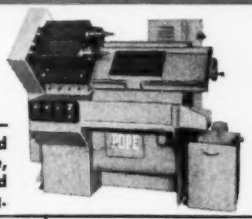


EXHIBIT B

POPE 1 HP, TOTALLY ENCLOSED 3600 RPM MOTORIZED, CARTRIDGE TYPE PRECISION SPINDLES
with double row cylindrical roller bearings and separate thrust bearings for no endwise movement of the shaft

EXHIBIT D

POPE
HEAVY DUTY, ¾ TO 100 HP DIRECT MOTORIZED SPINDLES
for Horizontal or Vertical Skin Milling, Grinding, Milling, Boring and Other Operations

EXHIBIT F

POPE HEAVY DUTY VEE-BELT DRIVEN, PRECISION MILLING SPINDLES,
and Wheel Heads, ½ to 50 HP

EXHIBIT G

POPE INTERNAL GRINDING SPINDLES
for Cincinnati, Norton, Landis and Heald Grinders and Springfield Vertical Grinders

EXHIBIT C

POPE HIGH SPEED VERTICAL OR HORIZONTAL ATTACHMENTS
for 6" x 18" surface grinders at 15,000 RPM

EXHIBIT E

POPE SUPER-PRECISION MOTORIZED TOOL AND CUTTER GRINDER SPINDLES
with clearance Angle Swiveling Heads for Angular Adjustment In A Vertical Plane

EXHIBIT H

POPE SUPER-PRECISION HIGH FREQUENCY HEAVY DUTY GRINDING AND MILLING SPINDLES
for speeds up to 100,000 RPM

WRITE FOR COMPLETE SPECIFICATIONS, PRICE AND DELIVERY

No. 105

Specify POPE PRECISION SPINDLES
POPE MACHINERY CORPORATION
Established 1920
261 RIVER STREET · HAVERHILL, MASSACHUSETTS

CIRCLE INFORM-A-GRAM KEY NO. 2231

THREE-DIMENSIONAL "PANTO-MILLER" IS ANNOUNCED

The new three-dimensional "Panto-Miller" Engraver has been announced by Johnson & Bassett. Maximum operating efficiency and accuracy are built into this multi-purpose, tracer-controlled machine.

Pantograph ratios from 1:10 to 1:1.5 can be handled by this engraver. It's used for production engraving, profiling, die cutting, and milling in steel, cast iron, non-ferrous materials, and plastics.

The cutter and tracer heads may be transposed, permitting enlarged reproductions as well as reduced ones to be made. An aligning bar is used for setting cutter and tracer points for accurate three-dimensional reproduction.

The machine has a variable speed control dial for instant spindle speed change from 1000 to 12,000 rpm. The stylus head receives collets from 1/16" to 3/8" and the cutter chuck, collet sizes to 3/8".

Complete details on this Model 3-A "Panto-Miller" are presented in a brochure from Johnson & Bassett, Inc., Production Tool Div'n, Worcester, Mass., or — **Circle Inform-A-Gram No. D2.**

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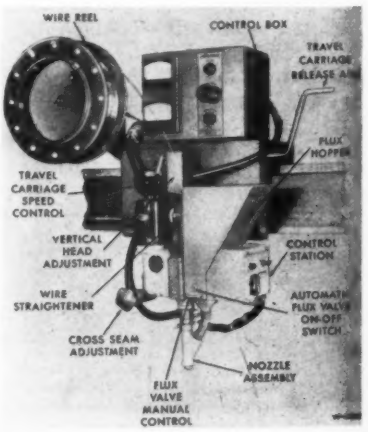
Phone MOnroe 6-4122
Manufacturers of standard steel drill jig bushings, dowel pins, chamfer micrometer gauges, portable bench centers, roughness comparison specimens, hardened and ground parts and assembly to order.
CIRCLE INFORM-A-GRAM KEY NO. 2241

SUBMERGED ARC AUTOMATIC WELDERS

A completely new line of equipment for hidden or submerged arc welding has been developed by The Lincoln Electric Company of Cleveland. The new line includes three new welding heads, new controls and adjustments, new accessories, and two new power sources. The new line has been developed to give complete flexibility to Lincolnweld automatic equipment in meeting requirements of any type of job.

The new welding heads, LAF-3, LAF-4, LAF-5, offer to users a choice of heads for either AC or DC current, field or shop welding, and constant political or variable voltage power source. New operation controls permit a choice of instantaneous starting, either hot for intermittent welding or cold for precision starting; a choice of variable inching speeds, either slow or fast, away from or to the work; and a choice of carriage operation to give stand-still starts, flying starts or manual control.

New features of the heads can be combined to give an almost unlimited choice of operating features to provide the best setup



for every type of job. The heads are designed to permit easy adaptation to fixtures, either as a complete unit or as separate components. They can be universally positioned in any angle in three dimensions or off center for round-about welding, and can be positioned on seam while welding. Fine vertical adjustment up or down is made by a simple hand screw and can be made while welding. Either welding jaws or a welding nozzle for more precise placing of flux can be used. Flux flow start or stop is controlled either automatically or manually. All controls are comparatively simple, using only rheostats, switches and relays so that any electrician can service the equipment or adapt it to fixture controls. Field operation is possible from engine-driven welders without additional line power being needed.

Electrodes in sizes from 3/32" to 7/32" are handled by one set of drive rolls, easily accessible through a hinged door. A separate set of easily changeable rolls handles 5/64" diameter wire. A roller bearing wire straightener with a single adjusting screw can be swung 360° about a vertical axis to accommodate wire reels in any position.

In addition to heads, mounting equipment is available to give either a stationary mounting, mounting on a self-propelled travel carriage, or on a self-propelled tractor. The heads can be adapted for Twinarc or tandem arc welding or for an oscillating attachment, the Spreadarc.

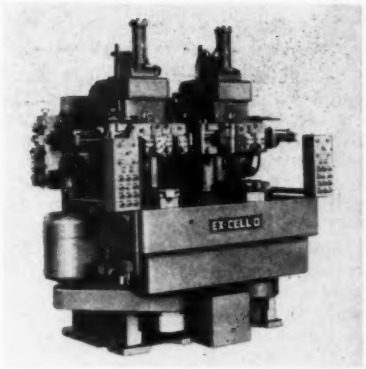
For further information write The Lincoln Electric Company, 22801 St. Clair Ave., Cleveland 17, Ohio, or **Circle Inform-A-Gram D3.**

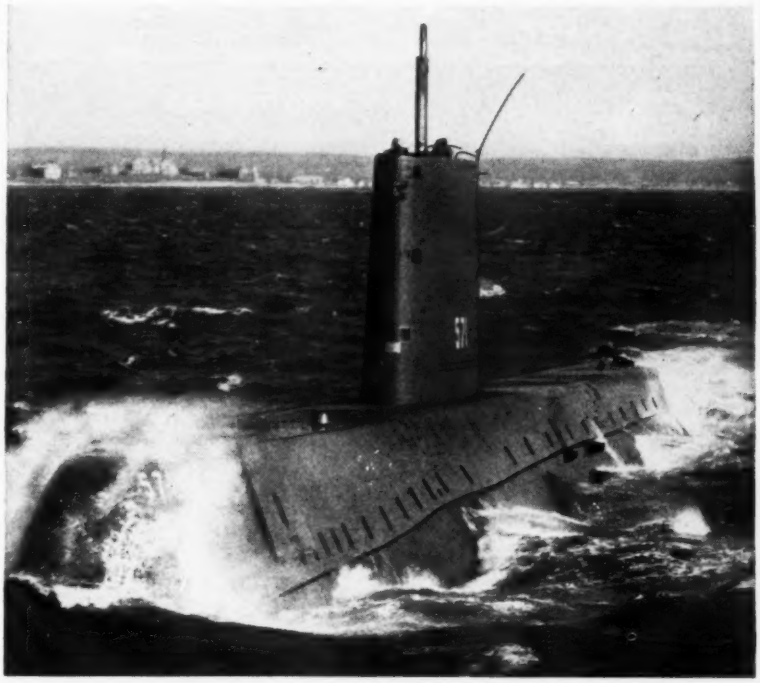
Vertical Boring Machine Combines Operations

Turning, boring, facing, grooving and chamfering can be done in combinations or as separate operations on a new vertical precision boring machine. Style 432 is produced by Ex-Cell-O Corp. of Detroit.

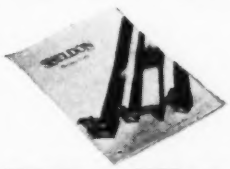
Each of two stations has a separate hydraulic system, counter-weighted compound tool slide, vertical spindle, drive equipment, and controls. During machining at one station, the other can be unloaded, loaded, and started on an automatic cycle without the operation affecting the other.

Vertical construction means convenience in loading and unloading, and adjusting or changing tools. This precision boring machine combines simple machine setup of cycles with easy operation and high productivity.





Down Deeper... Below Longer



Write for new 1955 catalog of Sheldon Machine Tools.

With those privileged to make atomic and submarine history on the Nautilus (and more recently on the Sea Wolf) was a SHELDON Lathe. Although probably the proudest, most significant voyage, this was not the first time SHELDON Lathes had gone to sea with the U. S. Navy. Since World War II, SHELDON Lathes have been the maintenance lathes on naval craft of many types.

SHELDON

Builders of Sheldon Lathes, Milling Machines, Shapers and Sebastian Lathes

Sheldon Machine Co., Inc. • 4235 N. Knox Ave., Chicago 41, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 2251

TUMBLER PAINTING

To save painters many dull hours arranging thousands of small parts on screened tables prior to spray painting, Martin has built an experimental tumbler rig that paints detail parts 10 times faster than normal spray painting methods.

Using the tumbling principle, a 10-gal. paint can with baffles, a detachable screen at one end, and a small hole at the other end, is made to rotate in a fixture horizontally with the detail parts inside. At 6-sec. intervals during the tumbling process, paint and air are sprayed alternately through the small hole. The complete cycle for painting the hundreds of parts on an average load is approximately 2 mins., including loading and unloading. Martin is currently developing a production model of the new tumbler.

Fig. 1. After detail parts are loaded into the paint tumbler, a screen is clamped over the opening in order to keep parts from falling out during tumbling process, and to provide an outlet for the paint spray.

Fig. 2. While tumbler is revolving at approximately 100 rpm, paint and air are sprayed alternately at 6-sec. intervals, permitting the paint to dry sufficiently to prevent surface damage.

Fig. 3. Parts are removed after cycle of approximately two minutes is completed.

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Roto-Finish processes are controlled precision finishing operations using low cost mass production techniques, which maintain exact tolerances on most any size or shape precision part with no significant dimensional changes. Roto-Finish speeds production, cuts maintenance expense, minimizes operational costs, yet produces top quality finishing results. Roto-Finish offers latest in controlled methods, materials and special purpose fixture equipment. Roto-Finish is your new opportunity in controlled precision finishing with guaranteed results!
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CIRCLE INFORM-A-GRAM KEY NO. 2261

SMALL-PARTS KIT CONCEPT FACILITATES PLYMOUTH ENGINE ASSEMBLY

ONE OF THE MAJOR OBJECTIVES in Plymouth's original concept of the V-8 engine plant was a moving parts inventory. Most important was the complete elimination of stockpiling along the final assembly line. An intricate system of overhead monorail conveyors, tied in with cycle programming of the individual production lines, delivers all parts and sub-assemblies to the assembly line . . . as needed, and where needed. There are no lift trucks operating in the assembly area, no skids, no piles of broken cartons and excelsior.

The big problem was how to deliver the many miscellaneous small parts — nuts, bolts, springs, etc. — parts primarily bought from outside sources. The system worked out cooperatively by Plymouth Plant Engineers and the Master Mechanic is this—for each group of operations on the assembly line, a color-coded tray with shallow depressions or compartments brings all of the small parts needed in the exact quantity required for one engine. These trays are filled in a Central Stock Disbursement area adjacent to the main Receiving area and are delivered to Assembly by overhead conveyor.

At the beginning of section 1 of the engine assembly line, for example, an operator removes a **Red** tray from the overhead conveyor and positions it on the machine between two engine pallets. A separate tray is used for each engine, and travels with the engine for the entire length of section 1. Each compartment of the tray holds a particular kind of part in the exact quantity needed for a single engine. The operator knows just where to reach and there is no confusion, no unnecessary leg work. At the end of section 1 the empty tray is removed from the machine and placed on the overhead conveyor for return to Central Stock Disbursement.

Farther along the assembly line, other trays deliver the small parts needed there. Special carriers, also color-coded, deliver certain parts in limited quantity for a certain number of engines. An **Ivory** tray, for example, brings "so many" oil dip sticks to the station where needed. The tray remains at that station until empty and is then replaced with a full tray.

Trays are hot-formed from U. S. Royalite plastic, containing about 30% natural rubber. These are so designed as to provide a number of compartments—each of suitable size and shape to hold the required quantity of a specific part.

. . . Continued on page 228

COLOR CODE
ASSEMBLY SUPPLY KITS

Engine Line Sect. I Tray Engine Line Sect. II & III Tray Cyl. Head Line Tray	Misc. Small Parts Misc. Small Parts Misc. Small Parts	Red Blue Tan
Spec. Carrier No. 1	Conn. Rod Brg. Shells Chain Case Gaskets	Gray
Spec. Carrier No. 2	Oil Filters Oil Pan Gaskets Cyl. Head Gaskets Int. Man. Gaskets	Yellow
Spec. Carrier No. 3	Oil Dip Sticks Accel. Link Brkts.	Ivory
Spec. Carrier No. 4 (for 2-Barrel Carburetor)	Dist. Cap & Wire Harness Distrib. Assy.	Green
Spec. Carrier No. 5 (for 4-Barrel Carburetor)	Dist. Cap & Wire Harness Distrib. Assy.	Wine

Automation

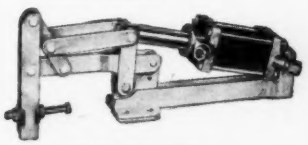
AND LAPEER AIR-OPERATED CLAMPS

Here are pictured just two Lapeer AIR-OPERATED Clamps—of many models available to assist in achieving AUTOMATION in your plant!

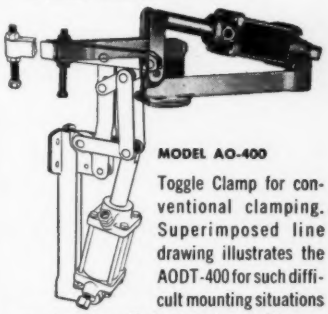
There are models for 200 lbs. . . . 400 lbs. . . . and 1200 lbs. clamping force!

And if it's HEAVY-DUTY type you need, we have those too!

MODEL AODT-400



Double-toggle clamp to clamp "around the corner"



MODEL AO-400

Toggle Clamp for conventional clamping.. Superimposed line drawing illustrates the AODT-400 for such difficult mounting situations as when the cylinder interferes with conventional clamping. 4710

See all of these at our BOOTH No. 706, METAL SHOW at Philadelphia in October.

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KNU-VISE PRODUCTS LAPEER MANUFACTURING CO.

3064 DAVISON ROAD LAPEER, MICHIGAN

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CIRCLE INFORM-A-GRAM KEY NO. 2271

The system—as developed in detail by Bob Patterson, Plymouth Plant Engineering materials handling specialist assigned to this project—calls for virtually all small parts to be automatically fed from hoppers into the trays. Within the Central Stock Disbursement area there are three separate waist-high conveyor lines for making up these kits—one line each for the Red tray, the Blue tray, and the Tan tray. These are similar in nature, so only the first will be described.

The conveyor is an automatic, over-and-under, floor-type, indexing or intermittent-transfer conveyor. The moving "belt" is made up of steel slats. The conveyor drive is equipped with a Warner magnetic clutch & brake with which the belt can be stopped within a tolerance of $\frac{1}{8}$". Conveyor movement will be timed the same as the final assembly line—16-second dwell and 8-second index.

Accurate longitudinal positioning of the trays on the belt is achieved by means of stop strips mounted on the belt at 4' center-to-center distance. At the loading end of the line, an operator removes an empty tray from the rise-and-fall Jervis B. Webb overhead conveyor and "bumps" it against the stop strip in the load station on the floor conveyor. Lateral positioning is achieved by pressing the tray down between two retainer strips. These are provided with a non-skid surface to prevent creep of the tray toward the open side of the nest.

The conveyor is flanked right-and-left, at each station, by Syntron vibratory-type hoppers with single, double, or triple feed tracks and escapements. The 30" hopper bowls hold an average of about 6 hours supply. Back of each hopper is a larger, supporting bin into which parts are loaded after removal from cartons, etc. There is a total of 32 hoppers on this first line.

Actually, the tray removed from the overhead conveyor will not be empty. Two versions of the Plymouth V-8 engine are assembled on the Cross line. One model is for use with the standard 3-speed transmission, the other is for use with the torque converter. Small parts requirements vary only slightly; therefore, the tray delivers to the assembly line the parts needed for each model.

Those parts affected by this variance in engine model requirements are concentrated in the first six stations on the conveyor line to simplify the electrical circuitry. The system that controls the automatic feeding of parts into the trays is so set up that one signal will energize the circuit for filling the tray from which parts were taken to meet "torque converter" requirements. Another signal will energize the circuit for filling the tray from which parts were taken to meet "3-speed" requirements.

When the operator removes an "empty" tray from the overhead conveyor, he observes which combination of parts is required and depresses the appropriate pushbutton. A memory circuit kills the affected escapements in proper sequence.

Micro-Switches at each station must be tripped by a tray moving into the station in order for parts to be fed through the escapements. This precludes the feeding of parts into an empty nest. A selective counting arrangement permits the feeding of the exact number of parts needed in a particular compartment of the tray.

At the end of the line, the completed kit is replaced on the overhead conveyor which has again descended within arm's reach. If the tray is not removed from the last station, a photoelectric cell setup prevents the conveyor from cycling.

The continuous overhead conveyor carries the **Red** trays on 8' increments, progressing twice as fast as the floor conveyor carrying trays on 4' increments. Other items are carried on the same overhead conveyor.

Roughly 80% of the small parts needed for the Plymouth V-8 engine can be fed automatically. Some

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Use an individually designed "Hole-Hog" Machine Tool for such jobs as:
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HU68 drilling machine with fourteen spindles adjustable in a 72 inch by 24 inch drilling area. Other sizes available.
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MOLINE TOOL COMPANY
100 20TH STREET MOLINE, ILLINOIS
CIRCLE INFORM-A-GRAM KEY NO. 2281

parts—because of shape, size, finish, or fragility—will be manually loaded into the trays, at least for the time being. Such parts include bearing shells that have a critical finish and spark plugs that have a relatively fragile ceramic body.

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U. S. SAVINGS
BONDS

"Minicaps" And "Minisets" Hold Small Devices

A complete line of miniature hex-socket cap and set screws, in diameters of No. 0 through No. 3, is now produced by the Allen Manufacturing Company, Hartford 2, Connecticut. Lengths run from 1/8" to 1/2"; cap and set screws are manufactured in both coarse and fine series, unified threads, except No. 0 and No. 1 diameters, which are standard in fine series only.

Called "minicaps" and "minisets", these very small screws have been developed to provide the advantages of dependable hex-socket fastening for a wide variety of very small devices, instruments and other products. The current trend toward miniaturization has developed a heavy demand for these extremely small sizes of hex-socket cap and set screws.

Among the many applications of these miniature screws are control and operating mechanisms for relays, computers and communications devices, guided missiles, TV and radio equipment, telephone equipment, meters and many other instruments and devices in the electronics field. There are also many applications for these miniature cap and set screws in the photographic field, in cameras, projectors, light meters and other devices which are constantly being re-designed for greater compactness. Other applications include electronic and X-ray tubes, where these miniature screws are used to hold filaments.

In general, these sizes are applicable wherever dependable fastening is required for very small parts. The strength of Allen minicaps and minisets is such that fewer screws, or smaller sizes, can safely be specified.

Extremely close tolerances and uniformity of sockets are maintained even in these very small screws. They will hold to the key or driver for easy starting. Cap screws have knurled heads for easier handling, and are trimmed both on top and under the heads, for neater fit and better appearance.

These miniature cap and set screws are available from leading industrial distributors throughout the country.

How to be an EXPERT at selecting a STOCK FEED!
. . . a short story to save long production hours!

Whenever a die feed is needed, it is needed for a specific application — stock width, thickness, press speed, part tolerance are all important factors. Twelve standard Dickerman feeds offer a range of capacities to handle virtually any stock at any speed the tooling will withstand . . . and at a fraction of the cost of complicated, special stock feeds. Production reports testify to millions of components produced — without a minute of downtime or lost production — from a Dickerman feed that outlasts the die itself!
HERE'S HOW to select the right feed with confidence — from the time tested and perfected Dickerman line.

FEED SPECIFICATION TABLE

Type of Feed	Size	STOCK SIZES HANDLED Thickness	Width	Max. Wire
*Hitch Feed	2"	.001" up to .031"	Strip up to 2.5"	.125" Dia.
*Hitch Feed J	2½"	.001" up to .050"	Strip up to 5"	.050" Dia.
Hitch Feed K	2½"	.001" up to .031"	Strip up to 5"	.125" Dia.
*Hitch Feed	4"	.001" up to .031"	Strip up to 8"	.125" Dia.
Die Feed	3" x 4" wide	.003" up to 3/16"	Strip up to 4"	5/16" Dia.
Die Feed	6" x 4" wide	.003" up to 3/16"	Strip up to 4"	5/16" Dia.
Die Feed	6" x 6" wide	.003" up to 3/16"	Strip up to 6"	5/16" Dia.
*Rol-Di-Feed	9"	.003" up to 3/16"	Stock wgt. up to 2#/ft.	Flat wire up to 3/16" thk.

* These models also available in left hand feed.

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3" DIE FEED
2½" HITCH FEED
4" HITCH FEED
2½" K HITCH FEED
6" x 4" DIE FEED
9" ROL-DI-FEED
2" HITCH FEED
6" x 6" DIE FEED

TEAR OUT THIS AD and keep it!
It's factual reference for saving dollars when selecting a feed.

CIRCLE INFORM-A-GRAM KEY NO. 2291

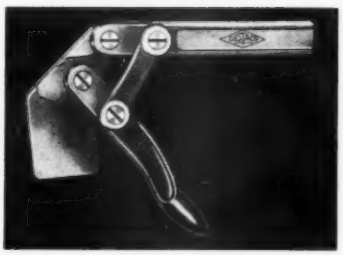
New Toggle Clamps Feature Replaceable Parts

A new heavy duty De-Sta-Co "Titan" toggle clamp, Model 557, features completely replaceable parts and holding pressures up to 4000 lbs. Produced by Detroit Stamping Co., it can be used for rugged production jobs requiring positive vise-like holding pressures.

This clamp has forged alloy-steel components, hardened and ground threaded pivot rods, and hardened serrated bushings. It weighs 4½ lbs.

Model 557 is to be used whenever overhead clearance is limited, since it has a hugging quality both in the open and closed positions. This is made possible by De-Sta-Co's flop-over movement.

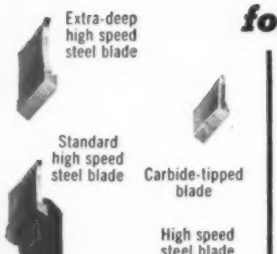
Full details on the new clamp may be obtained by writing to Detroit Stamping Co., 344 Midland Ave., Detroit 3, or — **No. D4.**



Flexibility *The Keynote of*

BOKUM RAPIDOR TURNING TOOLS

for cutting off and threading



In a recent advertisement, we described the features of Bokum Rapidor turning tools for roughing, semi-finishing and finishing. Here is the remainder of the Rapidor line: tools for external grooving, cutting off and threading.

They feature interchangeable blades—a fact which guarantees extra-long tool life. The unique design of the clamping of the blade and holder makes the tool rigid, eliminates chatter.

Other applications of Rapidor tools feature cutters for turning forms on the shoulders of a shaft, and radius tracer tools. Angular chip breakers, designed to remove chips away from the operator, can be furnished.

TRADE MARK REG U S PAT OFF

BOKUM TOOL CO. 14775 Wildemere Ave., Detroit 38, Mich.

Write today for Catalog 454 for a complete description of Rapidor Tools.

1 Long tool life; blades only need be replaced.
2 One holder for all lathe operations; high speed steel and carbide-tipped blades available.
3 Cutting, clearance angles are built into the cutter; constant clearance throughout life of tool.
4 Shape of cross section remains constant.
5 Resharpen top face only.
6 No set-up problems.
7 Rigid, large chip removal—cool cutting action.

CIRCLE INFORM-A-GRAM KEY NO. 2301

Ceramic Tool for Metal Cutting

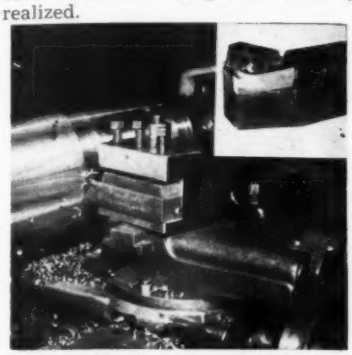
Through research at the Norton Company, an Alundum ceramic metal-cutting tool has been developed that has produced startling results. This was disclosed by a recent development test program at the Rodman Laboratory of Watertown Arsenal.

These Alundum tool bits are entirely in the development stage. Made of aluminum oxide, a Norton Alundum product, they are available only in limited quantities to industry for research and machining studies.

One importance of this new tool to industry lies in the abundant supply of ceramic materials. In addition, ceramic cutting tools may have an added advantage of being considerably less expensive than conventional tools.

Machining tests at Rodman Laboratory on steel (SAE 1020 and SAE 4140), commercial brass, and low alloy cast iron show that the hardness, high temperature strength, and wear-resistance properties of the Alundum cutting tools are superior to metallic tool compositions. By means of heavy, rigid tool hold-

ers, such as developed by the Rodman Laboratory, ceramic tool characteristics of lower tensile strength at room temperature plus less thermal shock resistance, have been overcome. Using solidly constructed engine lathes with high power capable of high speed operation, ceramic tool advantages can be fully realized.



Norton Alundum ceramic tool machining SAE 4140 steel on a 15-hp, 18" engine lathe. Speed is 1500 sfpm, feed 0.010" per rev., and depth of cut 0.250". Insert shows ceramic tool bit held in early experimental tool holder.

Because they can be operated at higher speeds, Norton ceramic tools cut up to three times faster than normal in these tests, required no coolant, and produced excellent surface finish. As more rugged machines with increased power become available, it is expected that even greater superiority will result.

Workpiece and cutting tool remain cool to touch when the tool is operated with proper tool geometry and chip breaker adjustment.

Because of the remarkable heat resistance of the Alundum ceramic tool, blanks may be shaped by dry grinding with diamond wheels. Resharpening is easily done on the same metal-bonded diamond wheel used for sharpening carbide tools.

These ceramic tools cut cleanly and show minimum scoring of the workpiece. Such characteristics are attributed to the absence of top face cratering by chip friction of the ceramic tool due to the low affinity of aluminum oxide for metals.

On cast iron containing sand holes which normally cause machining trouble, the Alundum ceramic tool cut through without chatter or tool fracture.

Tabulated data on this high density ceramic product showed the following on SAE 4140 steel: (see chart)

Later tests have shown that considerably higher machining speeds are possible.

This table shows the ability of the Alundum tool to remove steel at a higher rate than is usually found in other tools. It demonstrates also that the ceramic tool resists cratering and dulls more slowly even at high speed by a factor of at least two to one.

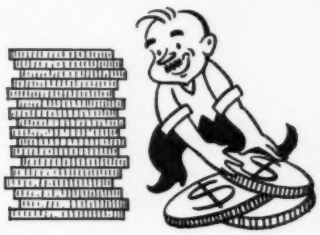
CUTTING TOOL MATERIAL

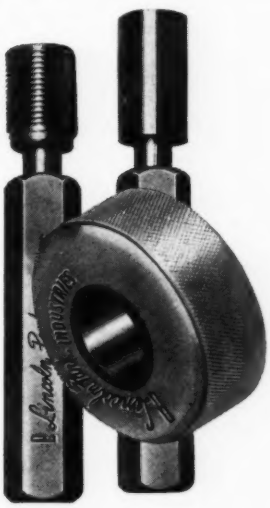
Factor	High-Density Aluminum Oxide	Carbide Grade C-6	Carbide Grade C-7
Speed (sfpm)	1000	500	500
Linear Feed (inch)	0.0075	0.0075	0.0075
Depth of Cut (inch)	0.125	0.125	0.125
Tooth Travel (inches)	82	80	90
Chip Platform Cratering (inch)	None	3/32	Slight
Edge (Land) Wear (inch)	1/64	3/64	2/64

Consider What YOU Will Save

with *Lincoln Park*

CARBIDE GAGES





. . . "a lone $38 carbide gage saves us $4000.00 a year"—"we cut gage checking expenses $20,000 annually with carbide gages"—"our initial gage costs were reduced $1,280.00 in nine months on a single part inspection."

These are statements backed by actual records of Lincoln Park customers. And they are not unusual—for throughout industry similar reductions in inspection costs have been and are being effected by the use of Lincoln Park carbide gages. Savings in gage replacement . . . less gage checking . . . more parts passed because of closer gaging tolerances . . . all are factors contributing to these lower costs.

Take a look at your gage applications and see what you might save by using carbide gages. Then call on Lincoln Park—the company that pioneered the use of carbides in gage manufacture—to meet your needs *exactly!*

THE PLUS IN PRECISION

Lincoln Park INDUSTRIES, INC.

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CIRCLE INFORM-A-GRAM KEY NO. 2311

HIGHER SPEEDS/
FASTER GRINDING/

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AIR GRINDERS

Model JA
50,000 R.P.M.
$42.00
IN U.S.A.

Weight 12 ounces; length 6¾ inches; chuck size ⅛ inch. Wheel guard removed for better illustration.

The RPM's stay up while grinding . . . not only when the grinder runs idle. That means better work—longer wheel life.

High speed grinding with small wheels was a Madison-Kipp development of the late twenties. It was born out of a pressing need in our tool room. Because tool room grinding problems are universal, we believe it will pay you to utilize Kipp grinders in your tool room as generally as we do in our own.

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Eliminate Extra Operations —Use Spiral's "Multiple-Operation" Step Tools

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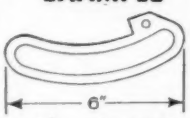
The sketch briefly describes the cost of a typical part made for one of our thousands of customers.

We have a short run stamping service to offer beyond comparison.

EXAMPLE



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$63.20 for first 100 pieces including tools.

$5.20 for each additional 100 pieces plus material.

Factory trained representatives in all centers. Write for full details.

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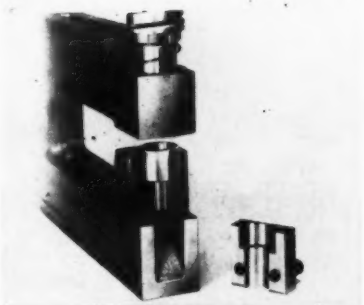
CIRCLE INFORM-A-GRAM KEY NO. 2323

INTRODUCES NEW UNITIZED PERFORATING UNITS

A new line of unitized perforating units has been introduced by Punch Products Corp. of Niagara Falls, N. Y. This newly organized company will manufacture "Unitized" hole-punching and notching equipment. Because a setup of "Unitized" tooling can be reused in other combinations, tooling costs are reduced.

The top view shows the two-piece punch. The punch head slides off the punch body so that only the toolsteel body needs to be replaced.



In the bottom photo, the small button die is held firmly in the die pedestal of the holder. It can be replaced without removing the holder from the setup.

Since "Unipunch" units have built-in stripping, only the force of the press-ram on the punch heads is needed to perforate the workpiece. The punch guide is free-floating in the upper arm of the holder which serves only to keep punch and die in concentric alignment.

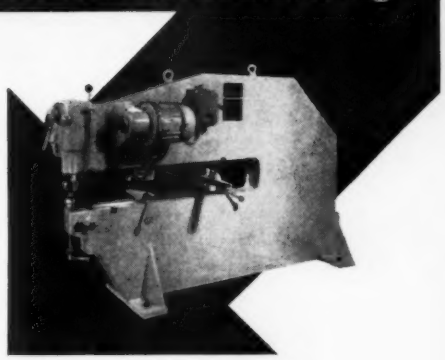
Holes can be punched in flat or flanged metal. Design features of the "Unipunch" units make it possible to punch close to the leg of the angle in angle iron.

THE INFORM-A-GRAM CARD PAGE 156A IS FOR YOUR CONVENIENCE WHEN INQUIRING ABOUT PRODUCTS DESCRIBED IN ADVERTISEMENTS AND EDITORIAL ARTICLES.

YOU'LL BE AMAZED at what PULLMAX DOES in metalworking

1 machine can do all these jobs in your shop

Ask any Pullmax user and he'll usually say, "I don't know how we ever got along without it." 7 sizes of Pullmax cut mild steel up to 1½". Pullmax does all the jobs shown here and generally pays for itself in three or four months by saving time, labor and material.



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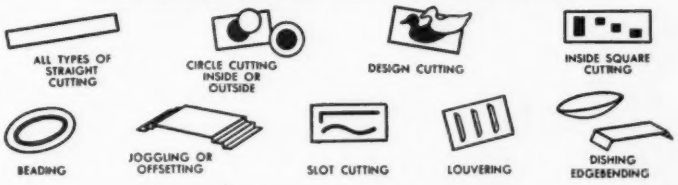

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OFFSET BORING HEAD repeats to .0001" in 30 seconds

DEKA-BORE (and only DEKA-BORE) can be adjusted in fractions of 1/10,000" on the full diameter as easily as reading 1/16" on a steel rule. NOT A VERNIER OR SCROLL ADJUSTMENT. Can be calibrated in increments of .00005 on radii or .0001 on diameter as easily as picking up .002 on a conventional micrometer dial.

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are yours?

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- ☐ Enamel flash
- ☐ Imbedded metal
- ☐ Lead deposits
- ☐ Carbon
- ☐ Brazing flux
- ☐ Weld spatter
- ☐ Stains
- ☐ Heat treat scale
- ☐ Radio-active oxides
- ☐ Dirt
- ☐ Grease
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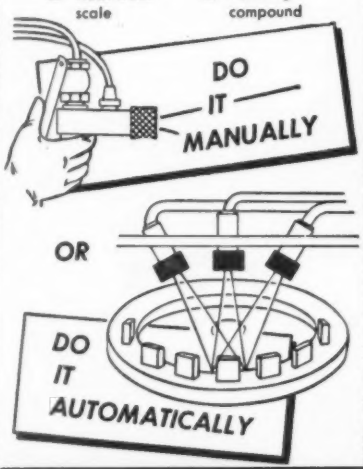

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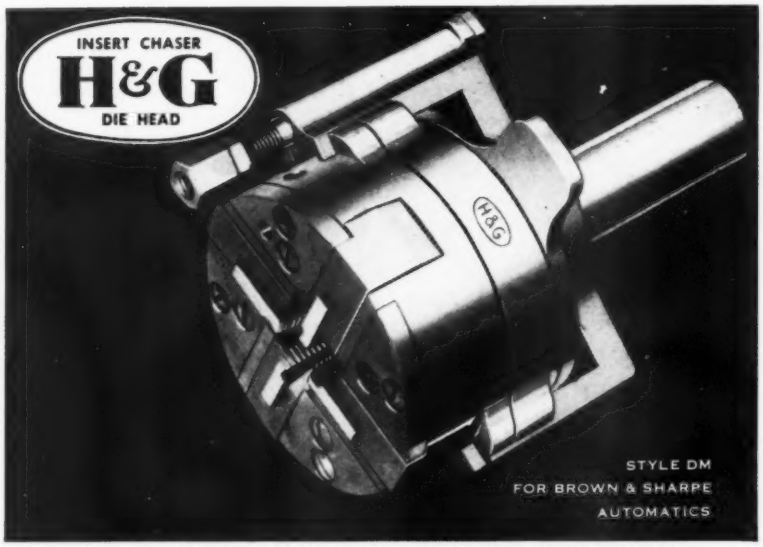

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On Brown and Sharpe, and other automatics.

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Insert chasers are like safety razor blades: they cost so little that you can throw them away when dull. Or, for utmost economy, you can resharpen them over and over again. Only a flash grind is required. For less than $40 you get a dozen sets of ¾–16 insert chasers, each set ground ready to go. You will be amazed at the quantity of threads they will cut, even to Class 3 specifications, with a minimum of downtime.
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Another basic problem in industry has been solved with the introduction of the Maico Feed Rate Meter which accurately reads the speed of travel of cutting tools, carriages, and heads in low speed turning, boring and grinding operations.

The meter consists of two parts, the pickup unit and the indicating unit. The pickup unit is easily mounted horizontally or vertically, as required, so that movements of the machine push a 3/8" drill rod through bearings in the unit. The speed of travel of the rod, which turns a calibrated magnetic drum, is transmitted to the portable indicating unit via vinyl-covered cable. The speed rate is then read at a glance directly from the large calibrated dial.

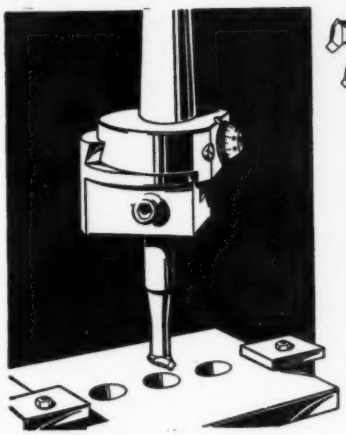
Speeds are indicated from a fraction of an in./min., up to 5, 10 and 20 in./min.

Provision can be made for use of a remote indicator or one indicator can be used with any number of pickups. The indicator operates at 110-117 volts, 60 cycles, drawing 30 watts of power. Overspeed or rapid acceleration will not damage either the pickup or the indicator unit. All electronic circuits in the Maico Feed Rate Meter were designed for extreme durability and accuracy.

Detailed information can be obtained from the Electronic Specialties Div. of the Maico Co., Inc., Maico Building, Minneapolis, Min., or — **Circle Inform-A-Gram No. D5.**

Latest trends, developments, and uses of welding will be revealed at the national Fall meeting of the American Welding Society in Philadelphia, Oct. 17-21. Some of the subjects to be discussed are carbon dioxide-shielded metal arc welding, the use of new metal powder electrodes, pressure welding rails, brazing, and resistance welding. The meeting will run concurrently with the National Metals Exposition.

CARBIDE BORING TOOLS



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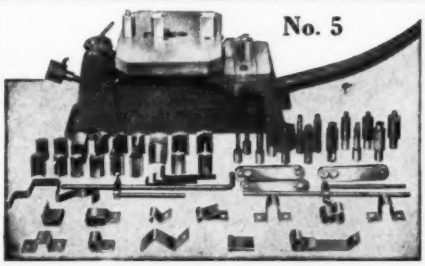

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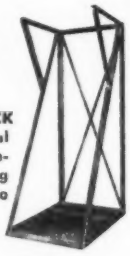
For storage of heaviest palletized loads — up to 4000 lbs. per shelf! No. WR-9



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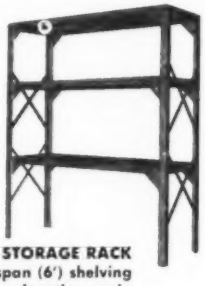

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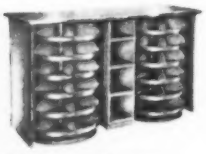

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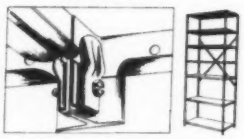

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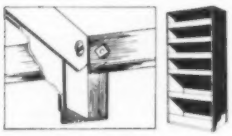

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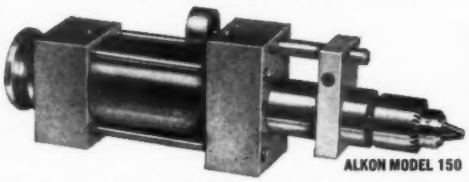

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has exclusive trilobe polygon drive

Unusual *hardened and ground* drive gives more efficient power transmission — reduces shock and vibration — cuts tool breakage. Model 150 taps, countersinks, reams, drills. Small, compact, light, it fits existing set-ups; fits where other drill units cannot . . . offers initial savings in drilling when mounted where —

- it can be set close to the work
- "break-through" burrs are not undesirable

Simple pneumatic and electric controls for light or heavy thrusts are easy to set up, require little maintenance. Available with standard 1½" and 3" strokes. Special sizes also available.

How much can you save with Model 150? Its price — **$97.50**

For complete information, write

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Pneumatic and hydraulic equipment

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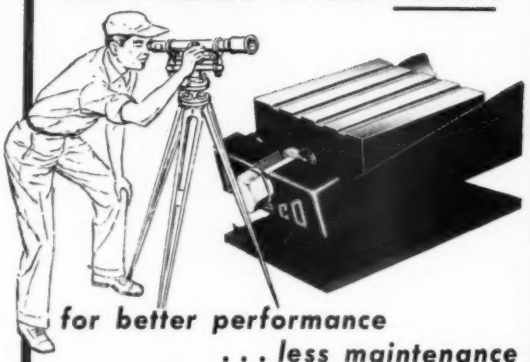
SET your machines level and KEEP them level!



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GUIDES FOR CAP SCREW SELECTION

Because assembly costs often count more than the purchase price of the fastener, designers and purchasing agents should look to the assembled cost in selecting fasteners, is the advice offered by Russell, Burdsall & Ward, fastener specialists.

In selecting cap screws, for example, compare heat-treated and bright finish types on the basis of physical properties. Bright cap screws get their color and shiny appearance from cold working. For many applications, bright cap screws, with their close tolerances, accurate threads and excellent appearance, are ideal.

Black cap screws get their color—and their combination of strength and ductility — from their high-carbon content and from heat treatment. They afford greater toughness for jobs where high stresses will be encountered.

Heat-treated cap screws can stay tighter than bright cap screws, point out the R B & W technicians. Holding power of a fastener depends on residual tension, which is dependent upon tensile strength. High-carbon heat-treated cap screws, because they have greater tensile strength, are capable of being stressed much higher than bright cap screws. If a joint is loosening, often the cure can be found in a black heat-treated cap screw tightened to set up the correct residual tension.

Though initial cost of heat-treated cap screws is greater than the bright finished type, they can often cost less than bright ones, particularly if holding power is the important quality needed. For example, to obtain a safe working load of 20,000 lbs, you can use a ¾" bright cap screw or a ⅝" black cap screw. The smaller screw, heat-treated, costs less than the larger bright one.

Correct use of cap screws in designing new equipment often permits reduction in size and number of fasteners and holes, thus saving production time and increasing the strength of the assembly. Even as replacement in old equipment, use of high-carbon heat-treated screws can be economical as they offer insurance against failures.

Be a litterbug — on purpose! ! Minneapolis-Honeywell's chief accountant, Al Rudell, solved the problem of misplaced tickets during a five-week inventory, by getting rid of wastebaskets. Instead, paper was thrown on the floor and sorted at each day's end, with the result that no tickets were lost.

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These include clamping handles, C. I. hand knobs, machine handles, compression springs, spherical washers, balanced cranks, compound rests, clamping levers and many other items at low prices.

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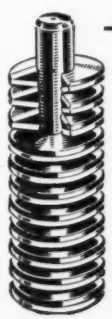

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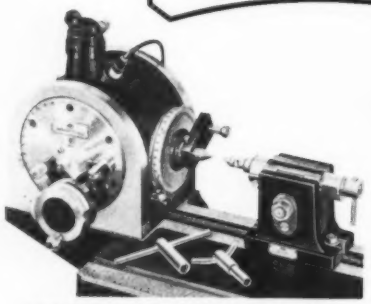

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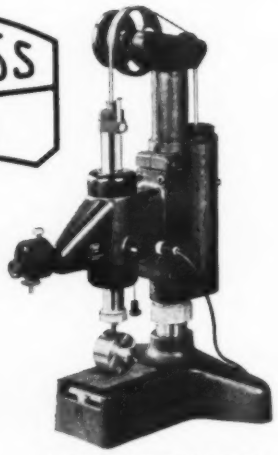

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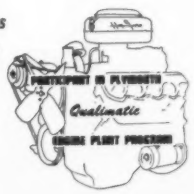

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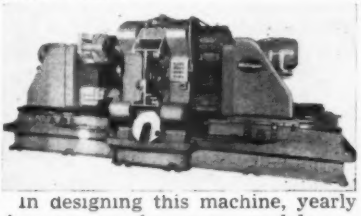
They utilized their standard way type horizontal units with automatic lubrication, and with master gear boxes on both horizontal units. Long stroke units were used to allow the heads to be retracted out of the trunnion to permit a quick change-over of tools.



In designing this machine, yearly changeovers for new models, or parts, were kept in mind, so that retooling requirements would be held to a minimum. That is why pot type heads were provided in each station. In the event of a part change, or new model, only the pot type heads need to be changed.

Power cylinders automatically clamp the parts. This power clamping is accomplished by hydraulic pressure, which is fed through the center shaft of the trunnion, by means of a specially designed rotary bushing.

Michigan Drill Head stresses the fact that great economy is accomplished by the utilization of their standard machine parts being engineered into the construction of special machines of this type.

This machine is designed for a central coolant system, with all chips dropping through the center of the machine to a conveyor. The machine is built to J.I.C. electrical and hydraulic standards.

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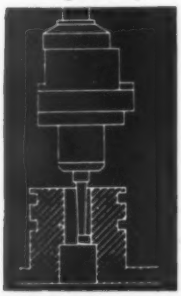

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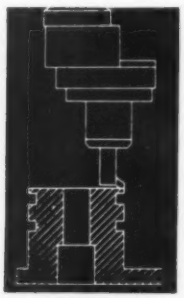

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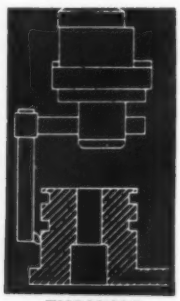

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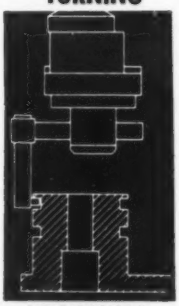

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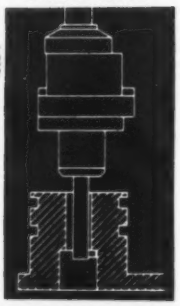

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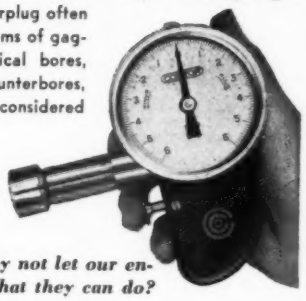

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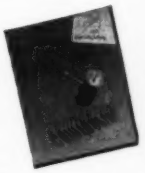

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New Flexibility Built into SPS Storage System

A unique storage system that brings a new degree of utility, flexibility and neatness to the stocking of small parts was introduced by Standard Pressed Steel Co., Jenkintown, Pa., at the Production Engineering Show in Chicago.

Called Hallowell storage wall, the system consists of nests of drawers that can be stacked together to form a self-supporting partition for office or production shop. At the same time the wall provides valuable, easily accessible storage for items such as drills, gages, test specimens, file cards and similar small parts.

If not used as a partition to separate work areas, the storage wall can be erected against building walls to put dead office space to work; installed underneath or above shop work benches for on-the-job location of spare parts and tools; or inserted within standard shelving and counter units.

Basic building blocks of the storage wall system are rugged steel drawer cases measuring 33¾" wide and 10½" high. The cases come in depths of either 11¼" or 17¼" and in units which provide storage in either three or four tiers of drawers.

Stacked and bolted one on top of the other, side by side, or back to back, the cases form a sturdy, stable structure that in self-supporting, yet versatile enough to be taken apart and relocated to keep pace with changing shop or office layout.

Small parts drawers that fit inside the cases come in three different widths—approximately 4", 5¼" and 8" wide. These widths permit complete interchangeability of drawers. Depending on storage requirements, drawers of a single size or drawers of all three sizes can be used side by side in a storage wall.

The drawers themselves are designed for nesting. They can be stacked for shipment throughout the plant without danger of sliding apart or spilling contents.

Cadmium-plated steel dividers for the drawers are adjustable on one-inch centers. Each divider has its built-in label holder.

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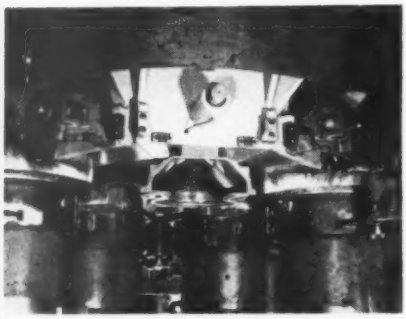
Clutch Housing Is Processed So as to Avoid Distortion

IN PROCESSING THE CLUTCH HOUSING for the standard-transmission version of the 1956 V-8 engine, Plymouth engineers felt from the start that the only way to machine it was to first grind the several flat surfaces. They chose grinders over mills or broaches because at best a clutch housing is a very flimsy part; and by grinding it you have less pressure on it, you have better size control, and you get a very good surface and a very flat surface.

By use of three grinders and by limiting each grinder to a single surface, the fixturing problem was simplified and the handling of the housing for loading and unloading was made considerably easier. Blanchard four-wheel, vertical spindle, automatic surface grinders are used for these operations. The first three spindles on each grinder are used for roughing and semi-finishing and the last spindle for finishing. Approximately ⅛" of metal is removed from each surface, while surface flatness is held to within 0.002".



This Blanchard is set up for grinding the pan rail face on the clutch housing. Note the workpiece just unloaded from the fixture and tipped to show the pan rim just ground. These surfaces are held flat to within 0.002".

Opposite sides of the clutch housing are face milled simultaneously. Fixtures to either side swing up carrying workpieces and rail sections out of the way for the milling head to feed in from the back, straddling vertical fixture and workpiece.

In the first grinder, the clutch housing is located on three points on the mounting face (where it mounts on the cylinder block). It is automatically clamped, and the transmission face is ground. In the second grinder, the housing is flopped over on the transmission face just ground, located on three points, automatically clamped, and the mounting face ground parallel with the transmission face. The third machine grinds the pan rail face used for transferring the housing through the transfer machine.

The Buhr multi-station transfer machine is a good example of a flattened line. There isn't a single vertical spindle in it. The workpiece is turned as necessary in order to utilize horizontal spindles. There is no pallet; the housing slides on rails from station to station.

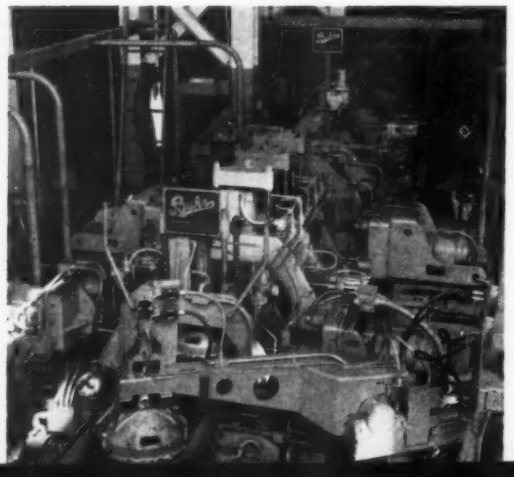
This is a three-stage machine. In the first stage, the housing is transferred through on its pan rail face, and the transmission face and the mounting face are worked. Then, in the second stage, the housing is automatically positioned over, and the pan rail face is worked. In the third stage, the housing is again automatically repositioned, this time for working both sides where linkages are to be mounted.

The clutch housing is started in the transfer machine by machining two pads, which are used to transfer on, and chilling and reaming two construction holes, from which to locate on all succeeding operations—all milling, drilling, reaming, countersinking, boring, and tapping required. Here in this machine is another example of where details to be held in precise relationship are all finished in the same station. In this case, the details are two dowel holes, the transmission shaft hole, and the starter shaft hole . . . all finish machined at one station.

Here in this machine are two stations where two Wesson Rigidcut face mills machine two sides of the clutch housing simultaneously. With the housing being transferred on its pan rail face, the workpiece in the milling station is clamped rigidly in such manner as to resist deflection under the milling pressures. Fixtures at idle stations to right and to left of the milling station clamp workpieces to the transfer rails and then automatically pivot to carry the workpieces, rail section and all, up out of the way for the twin-spindle milling head to feed horizontally in from the back to face mill opposite sides of the clutch housing in the milling station.

Leaving the automatic gaging and reject station at the end of the Buhr transfer machine, the clutch housing is picked up by a swinging-arm automation device, swung around 90°, and loaded into an Apex machine. Here two Welch plugs are hopper fed down tracks and automatically assembled into the clutch housing.

All the way through the line, care was taken with the clamping so as not to distort the clutch housing. Plymouth engineers were very careful to have clamping pressures taken straight through a solid casting wall and not across the bell, which has been done in some plants and which tends to bulge the casting. According to Plymouth engineers, "That's a mistake a lot of people make on a lot of parts. They imagine the parts are rigid. They're actually like rubber, if you're not cautious as to how you locate and clamp them."



"Flat line" for machining operations on the clutch housing. Apex swinging arm in foreground picks up finish-machined housing and carries it around corner to machine for automatic assembling of Welch plugs.

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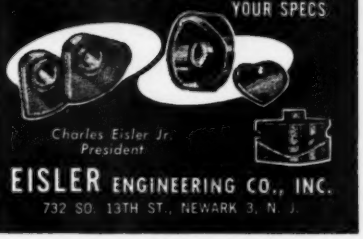

Charles Eisler Jr.
President

EISLER ENGINEERING CO., INC.
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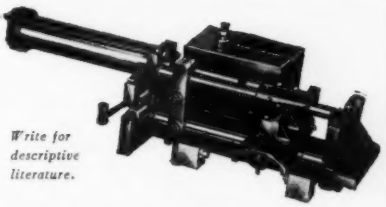


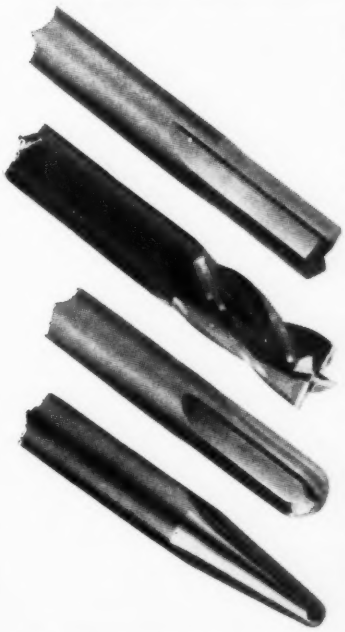
Write for descriptive literature.

COOPER WEYMOUTH, INC., 277 Noble Ave., Bridgeport 8, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 2434

new FORD

SOLID CARBIDE END MILLS



Here are a few examples of Ford's new line of solid carbide end mills. The line includes styles with 2 or 4 flutes — straight or spiral. Available with square or ball ends. Tapered body mills are also standard. All Ford mills are machine ground . . . to give uniformly accurate flute form and a constant relief angle. That's your assurance of longer life, smoother finish and faster cutting.

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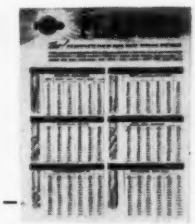

Rotary FORD Tools

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YES Send me Bulletin on new line of solid carbide end mills.

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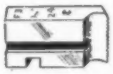

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Save 10-20% on special solid taps

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THE TAPERED SEAT ASSURES ACCURACY OF ± .0001

Manufactured in all tapers. 1 to 6 MT in stock. Special shanks and points made to order.

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Points illustrated are standard.

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ROYAL PRODUCTS

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Blackman & Neutzel Machinery Co., St. Louis, Mo., will handle automatic and tracer lathes in the south central states for Hydra-Feed Machine Tool Co. of Ferndale, Mich. The territory will include southern Illinois, Missouri, Oklahoma, and Kansas.

METALLURGY IS THEME OF INDUSTRIAL HEATING SHOW

Startling advances in the field of metallurgy are linked with the modernization of industrial heating equipment in Westinghouse Electric Corporation's new show entitled "The New Age of Metallurgy."

Among the newer metallurgical developments discussed in the oral and full-color film-strip presentation are the vacuum melting of metals and the technique of cage zone refining. In the vacuum melting process, metals are melted at the incredibly low pressure of one millionth of atmospheric pressure, eliminating practically all airborne impurities. In cage zone refining, a bar of metal is melted progressively from end to end, "flowing" impurities to the finish end of the bar. Using this technique, Westinghouse scientists report reducing impurities in some metals to only a few parts per billion.

While sponsored and produced by Westinghouse, the presentation is specifically for the industrial customers of utility companies. It consists of an oral presentation combined with a full-color film-strip projected on a 21' vistarama screen.

In discussing industrial heating equipment, the elimination of a separate heat treating department is stressed. Instead, it points out that more and more specialized furnaces are being manufactured to fit into a production line operation. Furnaces, it shows, are becoming a functional part of automated lines. A major factor in this trend can be attibuted, according to Westinghouse, to the increased use of special high temperature alloys that easily withstand temperatures of 2250° F.

Special attention is focused on the heat treating and fabricating problems involved with titanium and aluminum.

TORQOMATIC TAPPER CONSTRUCTED FOR SPEED AND ACCURACY

A revolutionary new production tool that delivers unusually high tapping speeds, known as the Jarvis Super Torqomatic, has been developed by the Jarvis Corporation of Middletown, Conn.

With the special construction features of the new Super Torqomatic, extremely high speeds are reached on all tapping operations; yet, precision is actually increased and tool wear materially reduced.

One unique feature that renders the Torqomatic far superior as a production tool is the helical gears with a 1 to 1 reverse ratio. These gears also serve to equalize the forward and reverse speed of the tap assuring a smooth retraction that will not endanger either finish or tool. The 1 to 1 reverse ratio makes the Torqomatic ideal for incorporation into automation operations.

Jarvis toggle-type clutch affords an ultra-sensitive forward and reverse action giving positive control over the quality and accuracy of the tap.

The Torqomatic also features a Jacobs Rubber-Flex Chuck so that only one collet is required to perform a full range of tapping operations. The heat treated magnesium body case is highlighted by a gray crackle finish. Permanently lubricated ball and needle bearings are used to provide lifelong service with a minimum of maintenance.

Additional information may be obtained from the Jarvis Corp., Dept. 6, Middletown, Conn., or **Circle Inform-A-Gram No. D6.**

announcing 2 NEW

DE-STA-CO TITAN TOGGLE CLAMPS!

(Models 557 and 558)

- THE ULTIMATE IN RUGGED CONSTRUCTION
- completely replaceable parts
- forged steel components
- 4,000-lb. holding pressure
- weight of 4½ pounds!

(Model 558 is the same as Model 557, but with upright handle!)

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Send for FREE Literature on these new DE-STA-CO Titans—Models 557, 558!

DE-STA-CO DETROIT STAMPING COMPANY

WORLD'S FIRST LINE OF TOGGLE CLAMPS

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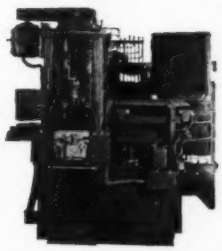
CIRCLE INFORM-A-GRAM KEY NO. 2451

MICRO-POISE AUTOMATION PRODUCTION BALANCING



Installed in a power conveyor system, this completely automatic machine is designed to balance and correct flywheels at the rate of 125 pieces an hour.

Careful design makes this high production rate possible and economical. The machine works simultaneously on three workpieces, each at one of the stations essential to the balancing operation: location, balance, and correction.

For any production balancing problem, chances are good that Micro-Poise has the best answer.

MICRO-POISE ENGINEERING & SALES CO.

Balancing Engineers

14851 Grand River Avenue Detroit 27, Michigan

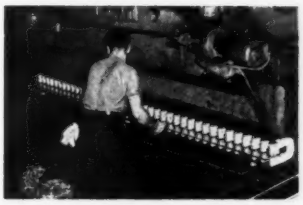
Telephone: VErmont 8-1134

CIRCLE INFORM-A-GRAM KEY NO. 2452

GUARANTEED

Reduced Press Down-Time with TOOLSET

. . . Your opportunity for BIGGER PROFITS



Do as Morrison Railway Supply Corp. of Buffalo, N. Y. did . . . they reduced press down-time on this forty punch job to 45 minutes, a savings of more than 90% by using TOOLSET self-contained units in place of fixed dies. The TOOLSET punches required only 2 hrs. set-up time outside the press.

This is only one profit building feature that you get with TOOLSET units, here are more:

- **LOW INITIAL COST**
- **FAST SET-UP BY UNSKILLED LABOR**
- **ELIMINATE COSTLY FIXED DIE SETS**
- **TOOLING REUSABLE, SET-UP AFTER SET-UP**

. . . These cumulative savings result in a substantial lowering of per piece part cost. And, in most cases, Toolset Units permit you to render faster service . . . a bonus feature in better customer relations.

Toolset Hole Punching and Notching Units are available in seven widths from ¾" to 3½"; throat depths from 4" to 16". Punches available in round, square, rectangular, obround or special shapes as required.

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Gentlemen:

Please furnish a copy of your Catalog on Hole Punching and Notching Units.

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CIRCLE INFORM-A-GRAM KEY NO. 2453

Cylinder Head Lines Feature Banking "Interchanges"

PRODUCTION REQUIREMENTS ON CYLINDER HEADS for the 1956 Plymouth V-8 engine necessitated the installation of four parallel production lines. These are made up of straight-line, multi-station transfer machines. Work flow is from the back of the plant to the front . . . through the 420' lines.

First stage in processing of the head castings is the broaching of various faces, using a Cincinnati horizontal surface broach. In choosing between milling and broaching, Plymouth tool engineers analyzed the tool cost for each process and the amount of space required for mills vs. broaches. It was determined that the actual cost per piece would be less on broaching than on milling.

Heads are manually loaded onto the entrance conveyor of the broaching machine. From here on, work progresses automatically. The machine ram is equipped with two banks of tools and cuts one head while stroking in one direction and cuts the opposite faces on another head while making the return stroke. Ram travel is 150 fpm. At each of the two working stations, a fixture indexes 90° up to bring the workpiece into position for the cut. A rollover unit located between the two fixtures takes a head being transferred from one fixture to the other and revolves it 180°.

From the broaching machine, cylinder heads advance from station to station through machines built by W. F. and John Barnes Co. Their lines were split up into four sections in order to minimize downtime problems. The decision as to what constituted a section was influenced by the number of tools and the type of tools. Drills have a relatively long life and consequently a sizeable number of drilling operations can be conveniently included in one machine section. On the other hand some boring tools, even when pre-set, require more time for tool changing. Their life is shorter, also. The presence of these tools then would lead to a shorter machine section.

The sectionizing of the line is influenced, also, by any machine details that affect downtime. At the end of each section there is a banking station, permitting the operator to feed parts out of a line into a "bank", or to return parts from the bank back into the line. Thus, when any section of the machine is down, all other sections of the line can continue to produce. This means that each section must have its own master control system.

A bridge extends over the four parallel head lines at the beginning of each section, and master control panels are mounted on the bridge. Plymouth engineers decided that one operator could safely control two lines, and the principal controls for those two lines are arranged on a console mounted for operator convenience on the bridge. This operator has control over the bank that serves the two lines, and he can divert blocks into the bank from either line or draw blocks from the bank for either line.

The master control panels on the bridge feature a graphic Detecto system developed by W. F. and John Barnes that permits fast isolation of electrical trouble. Plymouth's is the first installation of this system in conjunction with a machining line. The operator or electrician can check out every circuit, every contact, in rapid succession and quickly detect the one that is not functioning.

The Detecto system was found to save Plymouth about 75% of the time normally required for setup and tryout of a line of this capacity.

The transfer machines in the head lines are "segmented", i.e. each operational unit has its own base, its own hydraulics, etc. Idle stations between these units provide access to the tooling, hydraulics, etc. on either side. The head lines are flat; all operations have been worked out so that almost "no" vertical spindles remain. Horizontal spindles facilitate maintenance and thus reduce downtime, and also provide greater rigidity for certain operations.

. . . *Continued on Page 250*

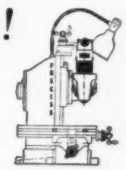
Control bridges are located over the four cylinder head lines, enabling an operator to control a major section of each of two lines. Bridge carries Detecto panels that facilitate the tracing of electrical failure to a specific control device or circuit wherever it may be located in the equipment below.

SUPER 30

World's most powerful and accurate hand!

Precise Super 30 Grinder-Millers bring new speed, accuracy and versatility to production or tool room milling, grinding or finishing operations. They weigh only 35 ounces, yet deliver 45,000 RPM, have a strong 1/5 H.P. motor, are accurate to .0001", run cool and can be used by hand or mounted on machines with abrasive wheels or new tungsten carbide tools. Save time, improve quality, increase tool life, and discover new tooling possibilities with the PRECISE SUPER 30.

Attach this ad to your letterhead for FREE demonstration or literature!



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Quality and precision since 1882

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New! DIAL INDICATOR Alina No. 77

- Graduated — .0001"
- Reading — 0-50-0
- Range — .200"
- Jeweled
- Shock Proof
- Revolutions of Hand — 20

The **ALINA No. 77** is a large capacity SWISS made indicator.

The steel case is **DULL CHROME** plated and incorporates a removable back plate. The dial is specially treated to eliminate glare, and the graduations are fine and distinct. Adjustable tolerance hands are built into the bezel.

The **ALINA No. 77** also features the popular **DOUBLE DIAL** and **TELL TALE HAND.** The indicator is supplied in a handsome form-fitting case.

Parts and service are always available in New York City.

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$26.80
in handsome contour case.
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CIRCLE INFORM-A-GRAM KEY NO. 2472

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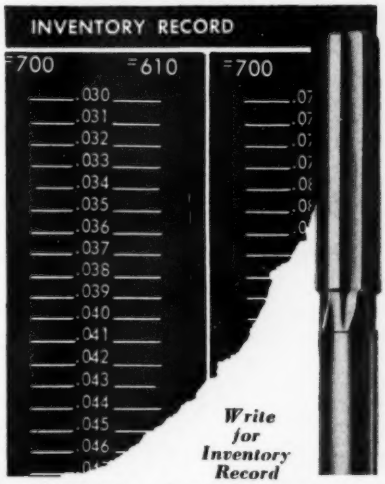

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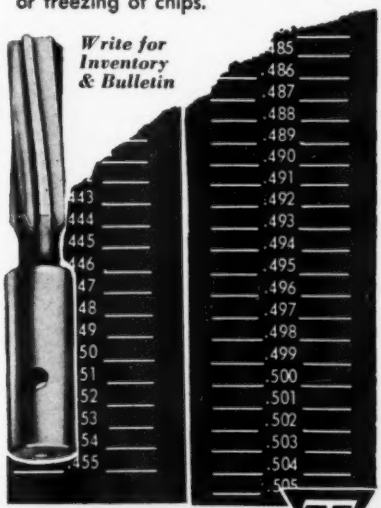
- All flutes are ground on face and back *AFTER* heat treatment for remarkably smooth reaming, preventing clogging or freezing of chips.



In emergency telephone: LIBERTYVILLE 2-4200

TWENTIETH CENTURY MANUFACTURING CO.
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CIRCLE INFORM-A-GRAM KEY NO. 2473

Transfer Machine for R. H. Exhaust Manifold Includes Assembly Operations

LIKE THE OIL PUMP BODY, the right hand exhaust manifold is a difficult part to process. In addition to the outlet tee in the middle, there is a butterfly heat control valve that presents complications. The one big problem, though, is that holes come in at so many different angles; consequently, it is not practical to use dial indexing machines. In order to design dial machines that would provide full service accessibility to all tooling, three or four machines would be needed.

Cognizant of these facts, engineers of the Plymouth Master Mechanic staff decided in favor of a multi-station transfer machine. But first the head joint face, which tends to be hard at times, is ground on a Blanchard three-wheel, vertical spindle, automatic surface grinder. The grinder removes approximately ⅛" of metal, holding flatness to 0.002" max.

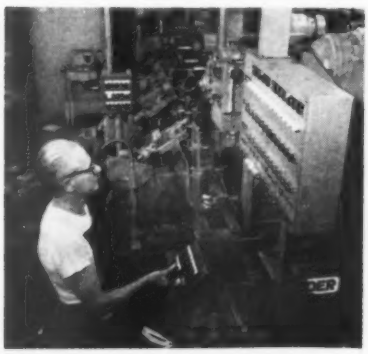
The first operation on the Snyder transfer machine is the drilling of holes in the head joint face. The part is then turned over, two drilled holes picked up from which to ream two construction holes, the latter then being used to locate for all other machining operations. These operations include drilling, reaming, tapping, boring the exhaust outlet hole, and milling various pads. On the same machine, two bushings that are used to hold the butterfly heat control shaft are hopper fed and automatically pressed into the part, as are several pins. A washing operation and air leak test are also included on the same machine.

Oil Pump Body Is Transferred for First Time

THE COMBINED SMALL SIZE and complex shape of the oil pump body has always made it difficult to process. The way this part has been designed in the past made it impossible to transfer it automatically.

When Plymouth engineers began to work on this part for the 1956 V-8 engine, they knew from past experience that it would be difficult. The Master Mechanic's group followed the general pattern of "if we can get it on two dial indexing machines, we'll go dial machine; if it takes more than two dial machines, we'll look at transfer machines." If a part can be processed on two dial machines, in general the efficiency is higher, there is less complexity of electrical hookup, and less mechanical trouble than on transfer equipment.

There were so many holes going in at different angles on this oil pump body that it just wasn't possible to put it on one dial machine and work it two ways and then go to another dial machine and work it another two ways. So many passes were required, that the part would have required seven dial machines in order that they be good, serviceable machines. Consequently, the engineers turned again to the problem of transfering the part.



This Snyder transfer machine represents the first successful attempt to automatically transfer an oil pump body through a long series of operations.

They first considered the use of a pallet; but a pallet would have to have clearance holes for all the holes in the part and there wouldn't be any pallet left by the time all those holes were put in it. The eventual solution was to start the part in one chucking on a dial machine and then transfer it through the remaining operations. John Anderson, the Chief Tool Engineer, worked with the product designers to have two ribs cast on the oil pump to provide a means of orientation and transfer.

One operator tends two machines. He takes a workpiece out of the dial machine and manually loads it into the transfer machine and pushes a button on the latter to put it in a preset cycle. And then he turns around and picks up a new rough casting and loads it into the dial machine and pushes a button.

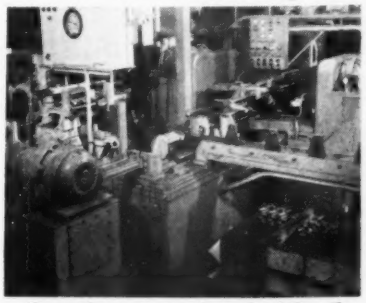
The Snyder dial machine mills the mounting face and the transfer ribs, and makes two locator holes that assist in transferring and orienting the part.

On the Snyder transfer machine, the part is manually positioned between two V's. It just sits there, on its cover mounting face, and then a walking beam type of transfer device comes up from below, actually picks up the part and moves it down the line to the next station and sets it down there, and at the same time moves all the other parts in the line on to the succeeding station. At each working station, the part is precisely located and clamped.

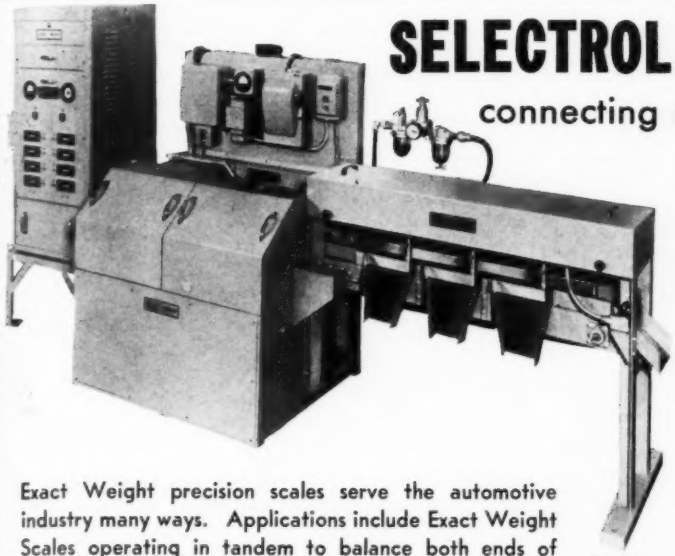
A total of 49 passes are taken at the part on the transfer machine. The machine was designed to provide accessibility to all the tools and to eliminate as many vertical spindles as possible. The walking beam device moves the parts through the first section of the machine, and then the part is slid on rails from station to station through the last section of the machine by means of the two little ribs that were cast into the oil pump body.

At the end of the Snyder transfer machine, the part passes through a Beach automatic air leak test station (operating on the Moore null-balance principle), and then is transferred automatically into one of three Ex-Cell-O transfer-type precision boring machines . . . whichever one has an empty station to accommodate the oncoming part.

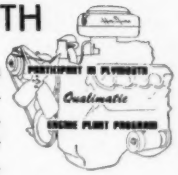
This last machine turns the OD of the oil pump body horn that locates into the No. 5 main bearing on the block assembly, it finish bores the pocket, it finish bores the shaft hole, and it mills the mounting pad . . . all in one clamping to get an exact relationship between these details. This permits a perfect mating between the oil pump body and the engine block. To eliminate some of the tool changes, the shaft hole is finish reamed to compensate for any minute wear on the finish boring tool.



From the test stand at the left, oil pump bodies are automatically transferred into one of three precision boring machines where the critical relationship of shaft hole, pocket, and mounting pad is achieved by a single clamping.



SELECTROL weighs, sorts, classifies, connecting rods at PLYMOUTH



Exact Weight Model 651-8 SELECTROL is used in Plymouth's new V-8 engine plant to automatically weigh and sort connecting rods. Ranges are adjustable and accuracy of ½ gram is possible.

Over-all view shows electronic controller unit (left) which operates channel gate and electro-magnetic counter for each classification. Center cabinet contains automatic weighing unit and handling equipment for loading and unloading scale. Eight classifications can be handled simultaneously. In practice one channel is for overweight; one for underweight, and six are for correct weight within established range for each grade rod.

Exact Weight precision scales serve the automotive industry many ways. Applications include Exact Weight Scales operating in tandem to balance both ends of connecting rods and set machine for milling boss. Another weighs pistons and pre-sets milling machine for correct stock removal. Exact Weight specialized precision industrial scales are also used for weighing, check-weighing and counting parts.

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GET ABSOLUTE *TOLERANCE HOLE DEPTH CONTROL* with WOHLNIP NON-ROTATING DRILL STOPS

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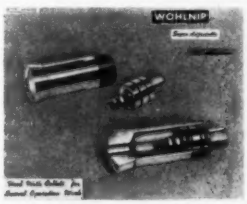

COLLET STOPS
(Patent Pending)

Used with collets for second operation work. Assuring consistent accuracy, permanent set-up, producing identical results. No alterations to your collets are necessary. Fully adjustable. Available for any size collets. END GUESS WORK AND REJECTS—

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Accuracy 001" - No Distortion
No Slipping - Everlasting

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ABERDEEN, SOUTH DAKOTA

If it's made by **Lee** *it's a* **"Knock-Out"**

CIRCLE INFORM-A-GRAM KEY NO. 2495

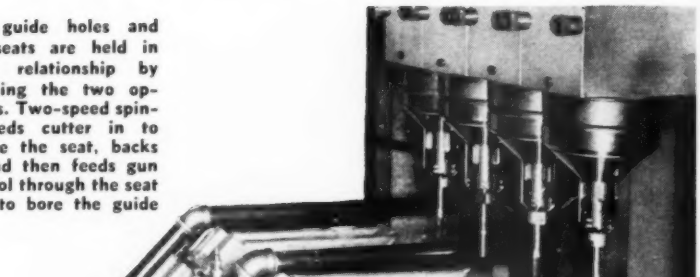
. . . interchanges, from page 246

One of Plymouth's objectives in planning the cylinder head lines was the attainment of greater accuracy in the relationship of the valve seat to the valve guide hole. This had long been a problem to builders of combustion engines who had found it impossible to machine the valve seats in one station, release the part, move it, clamp it at another station, and there machine the valve guide hole . . . without getting excessive runout. Considering that this concentricity is so critical that perfect isn't good enough, John Anderson and Henry Ibser of Plymouth proposed use of a new method of specialized tooling developed by W. F. & John Barnes Company.

The cylinder head is clamped in place and a circular carbide cutter is fed in and plunge cuts the valve seat. The tool is then backed out, the spindle is revved up to a very high speed and is then fed in to gun bore the valve guide hole, with the carbide gun bore tool being piloted through a carbide bushing that is integral with the valve seat cutter. Each precision spindle is belt driven in order to obtain a high speed and to be free of vibration.

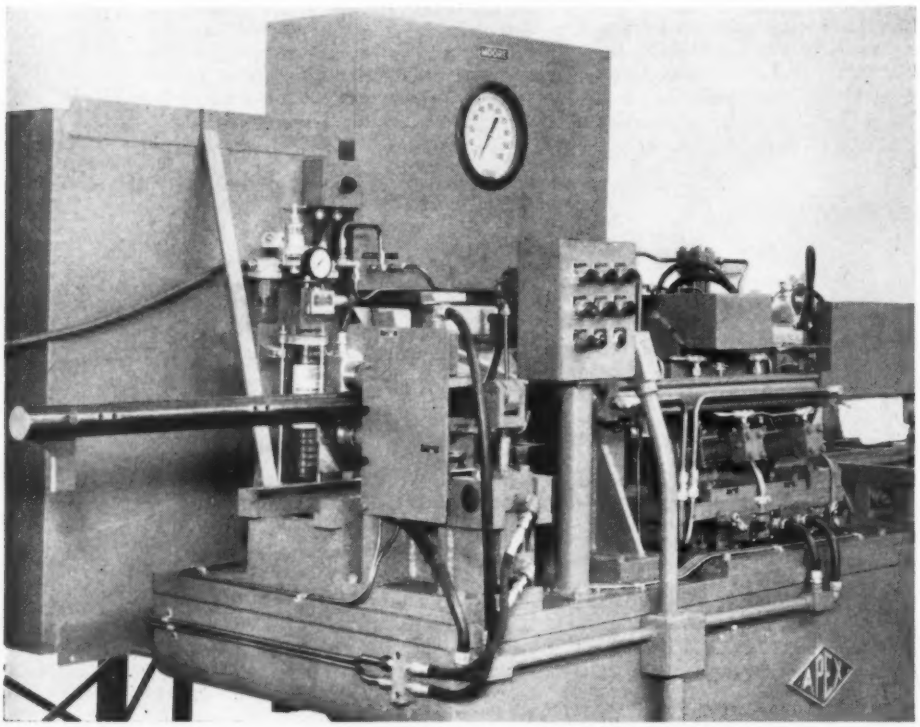
The tolerance standard established for total indicator runout on this operation is 0.002", as compared to 0.003" to 0.004" for most engine builders. Actually, not one Plymouth head has been checked to date that showed a runout over 0.0005" total indicator reading.

Valve guide holes and valve seats are held in precise relationship by combining the two operations. Two-speed spindle feeds cutter in to machine the seat, backs out, and then feeds gun bore tool through the seat cutter to bore the guide hole.



At the end of the line, the cylinder heads are transferred into an Apex automatic air leak test machine. This machine incorporates a Moore differential pressure system, which quickly signals the presence of any leakage. "Leakers" are automatically paint sprayed and rejected, and are then conveyed to the Apex water test machine. Here the head is hydraulically sealed with rubber closures and filled with water under pressure. The fixture is arranged on trunnions and hydraulically rotated for operator visual inspection.

Differential pressure system is employed in the automatic air leak testing of every cylinder head. "Leakers" are automatically color sprayed and rejected.



CARBIDE REINFORCED STEEL BORING BARS RESIST BENDING

A new boring bar has been developed by the Cyma Corp. in which a new reinforcing design principle has been utilized. This design and construction reduces bending or bar deflection, while making deeper cuts with heavier feeds, by as much as 50% compared to bars of conventional design.

Constructed of steel and reinforced with tungsten carbide, the new bar uses an entirely new design principle in its composite construction. Net result is a bar approaching a solid carbide boring bar in stiffness, yet possessing much greater strength and resistance to failure under excessive forces of impact. Manufacturing costs also are lower since carbide strips of rectangular cross section, in standard commercial sizes, can be used for the majority of popular boring bar sizes.

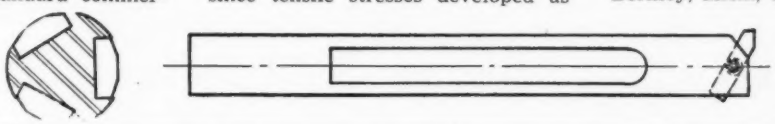
Three tungsten carbide strips are employed in the new bar. These are brazed into slots running lengthwise in the steel bar, extending to the portion of the bar subjected to greatest bending stresses. High strength is a direct result of the manufacturing process employed.

When the carbide strips are brazed in place, the difference in thermal coefficient of expansion causes the carbide to be preloaded in compression. Since tungsten carbide is one of the strongest materials known to resist compressive forces, there is no hazard created by prestressing in compression. In this case, prestressing is an advantage since tensile stresses developed as the result of outside bending forces are held to a minimum value.

According to lab and field tests, the new boring bar shows a resistance to deflection or bending equal to twice that of a plain steel boring bar. Break tests also disclosed exceptionally high strength, much beyond that of the carbide itself.

Currently, the company is manufacturing the boring bars in standard sizes ranging from 3/8" to 1½" dia. These are designed to use tool bits of high speed steel, carbide or cast alloys. The bars also are manufactured with special shanks or in multi-diameters to bore different diameters simultaneously.

For further information write Cyma Corp., 3581 Kipling Ave., Berkley, Mich., or — **Circle No. D7.**



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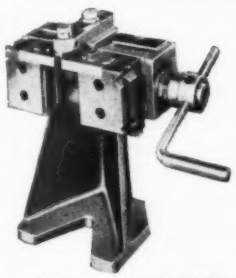

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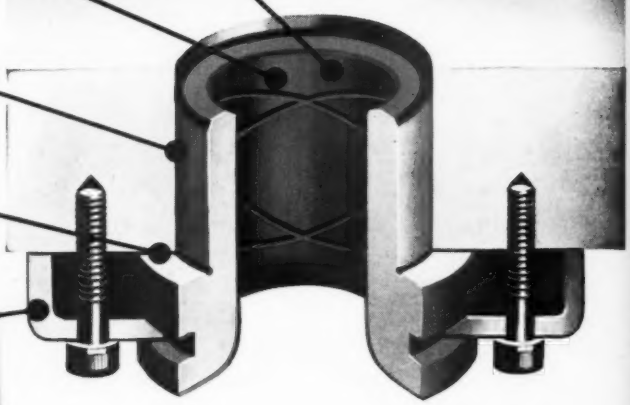

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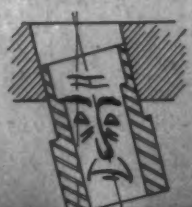

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